

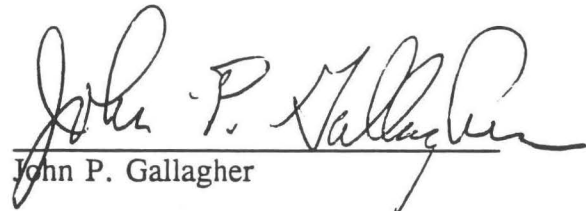
# **HISTORIC SHIPS PRESERVATION AND REPAIR FACILITY EVALUATION**


## **FINAL REPORT**

### **SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK**

**Prepared for:  
NATIONAL PARK SERVICE  
DENVER SERVICE CENTER**

**Prepared by:**

  
John P. Gallagher

  
Kenneth E. Nuss

**DESIGNERS AND PLANNERS, INC.  
2120 Washington Boulevard, Suite #200  
Arlington, VA 22204-5717**

**July 18, 1994**

2  
V  
13  
N315D47  
1994

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b>	1
<b>1.0 INTRODUCTION</b>	2
1.1 BACKGROUND	2
1.2 PRESERVATION AND REPAIR FACILITY REQUIREMENTS	3
1.3 OPERATIONAL ALTERNATIVES	5
1.4 PROCESS OF INVESTIGATION	6
<b>2.0 SITE ALTERNATIVES</b>	10
A. <u>MARE ISLAND</u>	10
A.1 SITE DETAILS	10
A.2 FACILITY ANALYSIS AND EVALUATION	10
A.3 OPERATIONS	20
A.4 SOCIO/ECONOMIC IMPACTS	21
A.5 COST ESTIMATE	22
B. <u>TREASURE ISLAND</u>	24
B.1 SITE DETAILS	24
B.2 FACILITY ANALYSIS AND EVALUATION	24
B.3 OPERATIONS	31
B.4 SOCIO/ECONOMIC IMPACTS	31
B.5 COST ESTIMATE	31
C. <u>ARQUES SHIPYARD</u>	34
C.1 SITE DETAILS	34
C.2 FACILITY ANALYSIS AND EVALUATION	36
C.3 OPERATIONS	39
C.4 SOCIO/ECONOMIC IMPACT	39
C.5 COST ESTIMATE	40
D. <u>BETHLEHEM STEEL YARD</u>	42
D.1 SITE DETAILS	42
D.2 FACILITY ANALYSIS AND EVALUATION	42
D.3 OPERATIONS	47
D.4 SOCIO/ECONOMIC IMPACTS	48
D.5 COST ESTIMATE	48
E. <u>HORSESHOE COVE</u>	51
F. <u>HUNTERS POINT</u>	53
G. <u>PACIFIC DRYDOCK</u>	55
<b>3.0 COMPARISON OF SITES</b>	56
<b>4.0 CONCLUSION</b>	59
REFERENCES	60
APPENDIX	61

## LIST OF FIGURES

Figure 1	BAY AREA MAP . . . . .	9
Figure 2	MARE ISLAND . . . . .	11
Figure 3	MARE ISLAND SHIPYARD . . . . .	12
Figure 4	EUREKA IN MARE ISLAND DRYDOCK #1 . . . . .	14
Figure 5	JEREMIAH O'BRIEN IN MARE ISLAND DRYDOCK #1 . . . . .	15
Figure 6	MARE ISLAND - BUILDING #46 FLOOR PLAN . . . . .	18
Figure 7	MARE ISLAND AFTER CONVERSION . . . . .	19
Figure 8	TREASURE ISLAND . . . . .	25
Figure 9	TREASURE ISLAND - BUILDING #3 FLOOR PLAN . . . . .	28
Figure 10	TREASURE ISLAND AFTER CONVERSION . . . . .	29
Figure 11	ARQUES SHIPYARD . . . . .	35
Figure 12	ARQUES SHIPYARD AFTER CONVERSION . . . . .	38
Figure 13	BETHLEHEM SHIPYARD . . . . .	43
Figure 14	BETHLEHEM SHIPYARD AFTER CONVERSION . . . . .	45
Figure 15	HORSESHOE COVE . . . . .	52
Figure 16	HUNTERS POINT . . . . .	54

## LIST OF TABLES

Table 1	NATIONAL PARK SERVICE HISTORIC VESSELS . . . . .	4
Table 2	SITE RANKING . . . . .	8
Table 3	SETUP COSTS . . . . .	56
Table 4	LEVEL OF WORK . . . . .	57
Table 5	FINAL SITE COMPARISON . . . . .	58

## EXECUTIVE SUMMARY

This report documents the evaluation and comparison of seven potential preservation/restoration sites to be used by the San Francisco Maritime National Historical Park (SFMNHP) in caring for their collection of historic vessels. The objective of this study is to provide a factual and objective description of each site, analyze the costs associated with converting each to SFMNHP use and provide recommendations on which locations best satisfy the requirements developed by the SFMNHP staff. This information will be used to assist the National Park Service (NPS) in developing the General Management Plan for this park.

Based on the site descriptions and cost estimates developed in Section 2, comparison tables with scores for the sites are presented in Section 3. Comparisons were developed for items such as cost of conversion, capability of the converted facility, distance from the Hyde Street Pier (where the vessels are currently berthed) and suitability of adjacent properties. From these scores a combined or composite score was calculated for each site, allowing a final ranking to be established.

The Mare Island Naval Shipyard site achieved the highest score and the top ranking, signifying that it appears to be most suited to the SFMNHP requirements at the most effective cost. The Treasure Island site (using the NPS drydock) had the second highest score, followed by Arques and Bethlehem sites essentially tied for third. It must be emphasized that these rankings are for comparison purposes only. The choice of weighing factors and their relative weight plays a large role in establishing the ranking, and both were established by the authors of this report as a reasonable set of comparison factors.

The choice of a site for establishing a ship preservation and restoration facility is indeed difficult due to the many conflicting factors involved. Further complexity is added when some of the sites are potentially only available for a short period of time. It is hoped that this study will prove useful to the SFMNHP in developing their final alternatives regarding historic vessel preservation/restoration for the General Management Plan.



## 1.0 INTRODUCTION

### 1.1 BACKGROUND

The National Park Service's (NPS) San Francisco Maritime National Historic Park (SFMNHP) currently has a fleet of seven historic vessels, most built around the turn of the century, as well as a Liberty Ship. This fleet consists of the following vessels;

- ALMA - 60', wood, scow schooner, built in 1891.
- BALCLUTHA - 256', steel, full rigged bark, built in 1886.
- EPPLETON HALL - 105', steel, steam paddle wheel tug, built in 1914.
- EUREKA - 300', wood, steam sidewheel ferry, built in 1890.
- HERCULES - 150', steel, steam screw tug, built in 1907.
- WAPAMA - 217', wood, steam schooner, built in 1915.
- C.A. THAYER - 156', wood 3-mast lumber schooner, built in 1895.
- JEREMIAH O'BRIEN - 441', steel Liberty Ship, built during World War II.

Presently, all of the vessels except the JEREMIAH O'BRIEN, the HERCULES and the WAPAMA are kept at the SFMNHP interpretive display booth at the Hyde Street Pier. The HERCULES is temporarily tied up at the Army Corps of Engineers pier in Sausalito, along with the WAPAMA which is no longer seaworthy and is kept berthed on top of a barge.

The legislation establishing San Francisco Maritime National Historical Park stated that the purpose of the park was: "to preserve and interpret the history and achievements of seafaring Americans and of the Nation's maritime heritage, especially on the Pacific Coast...." That legislation stipulated that a general management plan for the Park be prepared and include:

"plans for the preservation of each historic vessel, including docking facilities, maintenance and ship repair facilities, and estimates for the costs thereof; a determination of the need for permanent docking facilities in a location best suited to the preservation of the historic vessels and for visitor access to the historic vessels; and methods of accommodating visitors while protecting the historic vessels; and methods for providing for the proper care, exhibition, and storage of the park collections;..."

With the General Management Plan currently underway, it has become evident that the issue of long term ship repair and preservation is of utmost importance and should be thoroughly addressed in the planning alternatives. The Hyde Street Pier currently provides the location for the majority of the daily topside maintenance which is a critical requirement in the preservation of historic vessels. However, this location does not address the need for cyclic work in shipyards for maintenance of the underwater protection of hulls and for major reconstructions which cannot be accomplished afloat. Because of the recreational uses adjacent to Hyde Street Pier and its physical limitations, major ship reconstruction operations are unsuitable and are therefore contracted to local commercial shipyards.

With the reduction in commercial activity and military spending in the San Francisco Bay Area, the number of available commercial shipyards is diminishing. Based on this trend, it would be in the best interest of the SFMNHP to secure a site for its own use as a preservation and repair facility. This will insure a cost-effective means of maintaining the fleet of historic vessels.

The focus of this evaluation is to provide the NPS with an objective preliminary evaluation and analysis of potential preservation and repair facilities to determine their suitability for SFMNHP use. This evaluation will assist the NPS in development of alternatives as part of the General Management Plan.

## **1.2 PRESERVATION AND REPAIR FACILITY REQUIREMENTS**

The facility must allow for all levels of restoration and repair work. This includes work on the underwater hull of the ship, which will require some means of dry berthing. According to reference (1), the basic requirements of the preservation and repair facility would be as follows:

- A drydock, marine railway, or some other means of removing ships from the water to allow for hull work.
- Cranes capable of lifting large timbers, engines, or any other such components.
- A wood shop capable of turning large timbers, and at least 3000 square feet of space.
- A metal shop with forging, welding, and flame cutting tools.
- An outdoor storage and layup area of at least 2500 square feet.
- Offices for a small number of NPS staff, shipyard managers, etc.
- A classroom for the training of volunteers.
- Easy access to the site by trucks with large loads.

facility should be able to support use by private individuals or companies interested in performing different levels of boat construction, repair and maintenance. This could potentially reduce the costs of the facility.

Another important consideration for the site is the ability to provide space for a permanent display of the WAPAMA. Currently the WAPAMA is kept out of the water on a barge. The SFMNHP would like to replace this temporary arrangement with a permanent land display that would allow visitors to go on board the vessel for interpretive purposes. This will require a significant amount of space since the WAPAMA is over 200 feet long.

### **1.3 OPERATIONAL ALTERNATIVES**

The variety of sites examined during the survey gives many possible operational alternatives for the NPS to consider. For the sake of simplicity, three generic options are discussed here. Within each site description, specific variations on the appropriate alternatives are discussed which are tailored to the peculiarities of the site.

#### **Operational Alternative "A"**

The NPS would maintain complete control of the preservation and repair facility, with SFMNHP staff performing all work on the vessels. The site would be owned or leased on a long term basis by the NPS. The site would be converted for their use only and equipped accordingly. The majority of all maintenance and restoration work on the vessels would be accomplished by SFMNHP workers under SFMNHP supervision. Only specialty work would be subcontracted out on an "as needed" basis. When the SFMNHP has no active projects, the facility would be idle and used only for storage of equipment and materials, or for classroom and interpretive activities.

This operating alternative has the advantage of maximizing SFMNHP control of the facility, both for maintenance and availability for work on the museum vessels. The major drawback is increased cost, since none of the carrying costs for the facility would be offset by other paying customers. In addition, the SFMNHP would take on the day-to-day requirements of handling increased staff (with hiring and layoffs to suit workload) and operating a ship repair facility.

#### **Operational Alternative "B"**

The NPS would maintain ownership (or long-term lease) for the preservation and repair facility. SFMNHP staff would manage the operation of the total facility, overseeing facility maintenance and the work on the vessels. The majority of the work itself would be performed by subcontractors or outside labor. During extended periods of inactivity on the museum fleet, the SFMNHP staff could arrange for other parties to "rent" the facility for work on their own vessels/projects. This work would be accomplished by the renter's workforce under his own supervision. Some oversight by the SFMNHP staff would be required to ensure proper use of the equipment and the facility, and would be paid for by the renter.

This alternative offers the advantage of lower cost to the SFMNHP as some outside work will help generate income. The amount of income would be uncertain, as potential users would need a flexible time schedule to work around the SFMNHP needs. SFMNHP staff would still have to take on the management burden for the facility.

### **Operational Alternative "C"**

The NPS would retain ownership or long-term lease for the preservation and repair facility, but turn over management of the facility to a reliable contractor. The contractor would be required to maintain the facility, operate the equipment, and provide the workforce, either with its own employees or with those of subcontractors. Work for the maintenance and restoration of the museum vessels would be performed by the contractor in a manner similar to the normal arrangements with a commercial yard. The only significant difference would be the lack of the normal open bidding process once the contractor was selected. Instead, a long-term services contract would be used, whereby the SFMNHP could negotiate preset labor rates for the various trades and set costs for standard work items such as dockings, planking renewals, etc. Allowances would be made to give the SFMNHP preferred scheduling for restoration and maintenance projects on their vessels. SFMNHP supervisors would also be allowed to inspect and guide the work when necessary.

When SFMNHP had no active projects, or if additional space became available, the contractor would have the ability to use the facility for other work on a commercial basis to help defray costs for facility upkeep. This work, taken on a "not to interfere" basis, would help stabilize the contractor's workforce, lower the rates which the SFMNHP would have to pay, and provide an incentive for the contractor to maintain the facility in optimum condition on a regular basis. A profit-sharing agreement between the SFMNHP and the contractor would have to be worked out which fairly reflects the interests of both parties. This arrangement could provide suitable incentives to attract a responsible contractor and potentially allow the SFMNHP to have minimal or no carrying costs for the facility.

A potential drawback of this alternative would be the outcry from other commercial yards in the Bay area who as a result would now have to compete with a facility indirectly subsidized by a government agency. In addition, if the contractor did not perform adequate maintenance on the facility, the SFMNHP would be left with the responsibility of terminating the agreement and would have to bear the cost of bringing the facility back to good working order. Selection of a responsible contractor and drafting a strong agreement are essential for making this a successful alternative for the SFMNHP.

## **1.4 PROCESS OF INVESTIGATION**

Seven sites were considered for use as a preservation and repair facility for the SFMNHP. Each was evaluated according to its existing facilities and the potential for conversion or expansion. Different levels of ownership and management by the NPS were considered for each site, and cost assessments for conversion were made.

- **Arques Shipyard** - This site is a portion of the MarinShip facility that built Liberty ships and T-2 tankers during World War II. It is located in Sausalito, minutes north of the Golden Gate Bridge.
- **Bethlehem Steel** - This is a former barge construction site. It is located in the City of San Francisco, adjacent to the facility operated by San Francisco Drydock where the EUREKA was recently drydocked.
- **Horseshoe Cove** - This is a small, protected cove located immediately across the Golden Gate Bridge from San Francisco, within the East Fort Baker Army post. It is home to a yacht club and a small Coast Guard station.
- **Hunters Point** - This is a large, abandoned naval shipyard. It is essentially shut down and is soon to be turned over by the government to the City of San Francisco for redevelopment. It is located just north of Candlestick Park.
- **Mare Island Naval Shipyard** - This is another very large, but well maintained, naval shipyard that is returning to civilian control. It is located in the City of Vallejo at the very north end of San Francisco Bay.
- **Pacific Drydock** - This is a pier facility controlled by the Port of Oakland. It was recently used as site where the NPS kept its floating drydock.
- **Naval Station at Treasure Island** - This is a man-made island in the middle of San Francisco Bay connected to San Francisco and Oakland by the Oakland Bay Bridge. It currently serves as a naval station that is slated for closure in 1997.

The locations of all of these sites in the San Francisco Bay area are given in Figure 1. Following initial site visits, and using the requirements discussed earlier, the sites were ranked in reference (2) according to their suitability for SFMNH use. These initial rankings are given again in Table 2.

The initial visits were followed up by a second, more extensive survey which included:

- a) Examination of current facilities, particularly shop spaces and means for hauling or drydocking vessels.
- b) Interviews with persons knowledgeable about the current usage and future plans for the site.
- c) Measurements of key dimensions (water depths, slip widths, etc.) where information was not available on plans.
- d) Visual assessment of potential for hazardous material contamination.

- **Arques Shipyard** - This site is a portion of the MarinShip facility that built Liberty ships and T-2 tankers during World War II. It is located in Sausalito, minutes north of the Golden Gate Bridge.
- **Bethlehem Steel** - This is a former barge construction site. It is located in the City of San Francisco, adjacent to the facility operated by San Francisco Drydock where the EUREKA was recently drydocked.
- **Horseshoe Cove** - This is a small, protected cove located immediately across the Golden Gate Bridge from San Francisco, within the East Fort Baker Army post. It is home to a yacht club and a small Coast Guard station.
- **Hunters Point** - This is a large, abandoned naval shipyard. It is essentially shut down and is soon to be turned over by the government to the City of San Francisco for redevelopment. It is located just north of Candlestick Park.
- **Mare Island Naval Shipyard** - This is another very large, but well maintained, naval shipyard that is returning to civilian control. It is located in the City of Vallejo at the very north end of San Francisco Bay.
- **Pacific Drydock** - This is a pier facility controlled by the Port of Oakland. It was recently used as site where the NPS kept its floating drydock.
- **Naval Station at Treasure Island** - This is a man-made island in the middle of San Francisco Bay connected to San Francisco and Oakland by the Oakland Bay Bridge. It currently serves as a naval station that is slated for closure in 1997.

The locations of all of these sites in the San Francisco Bay area are given in Figure 1. Following initial site visits, and using the requirements discussed earlier, the sites were ranked in reference (2) according to their suitability for SFMNHP use. These initial rankings are given again in Table 2.

The initial visits were followed up by a second, more extensive survey which included:

- a) Examination of current facilities, particularly shop spaces and means for hauling or drydocking vessels.
- b) Interviews with persons knowledgeable about the current usage and future plans for the site.
- c) Measurements of key dimensions (water depths, slip widths, etc.) where information was not available on plans.
- d) Visual assessment of potential for hazardous material contamination.



These surveys were conducted by experienced Naval Architects with shipyard experience, both in new construction and repair.

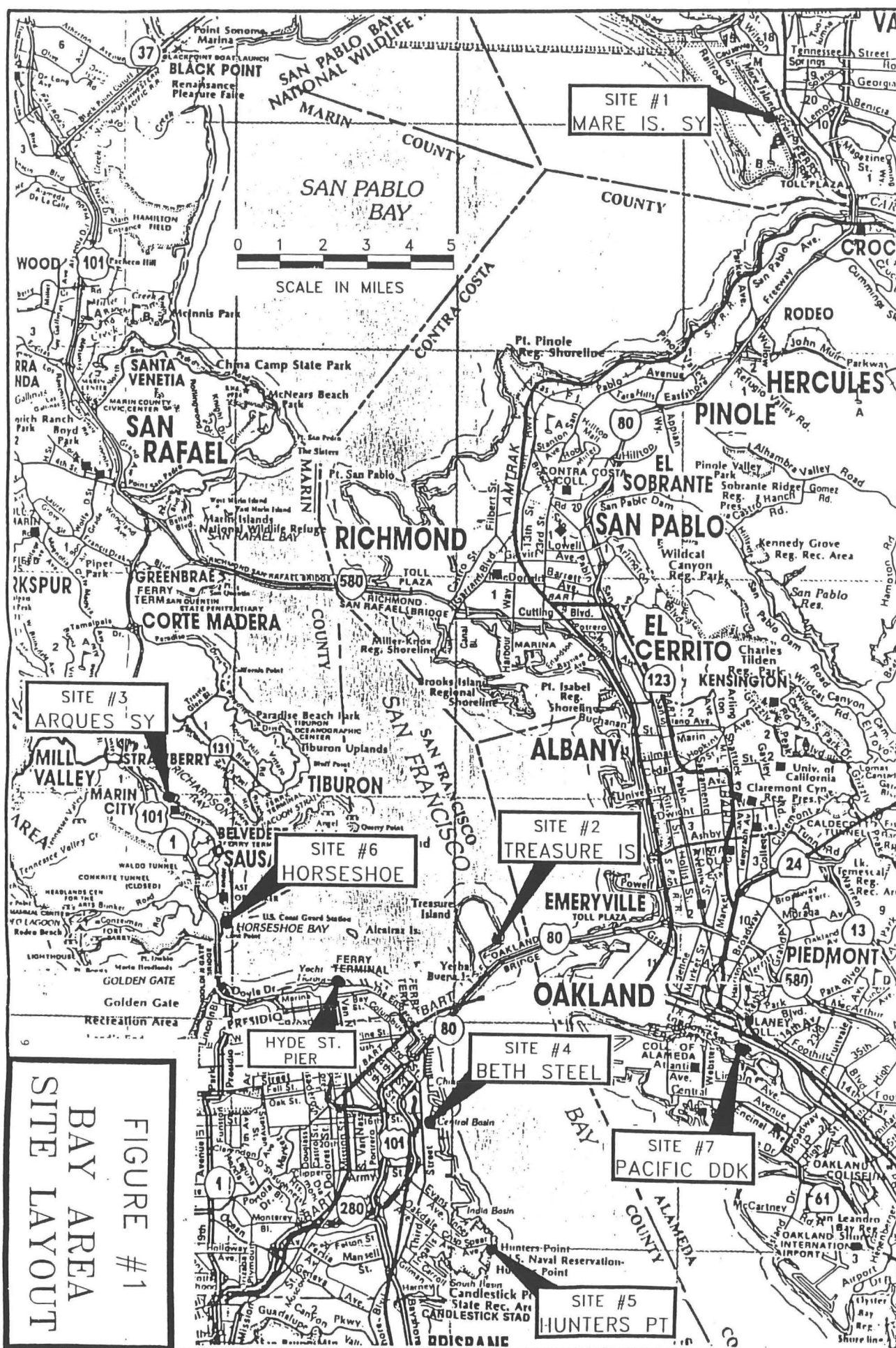
Three sites were found to have little potential: Pacific Drydock, Hunters Point and Horseshoe Cove. Only a cursory description is provided for these sites. Two sites were considered as having moderate potential: Arques Shipyard and the Bethlehem Steel Yard. A moderately detailed description is provided for these sites. The two sites with the highest potential were Mare Island and Treasure Island. These sites are detailed fully in this report, including class "C" cost estimates for conversion to SFMNHP use.

#### INITIAL SHIPYARD SITE RANKINGS

SITE RANK	SITE NAME & LOCATION	FACILITY POTENTIAL	CURRENT CONDITION	ADJACENT AREAS	DISTANCE HYDE ST	TOTAL SCORE
1	MARE IS. NAVY YARD VALLEJO	10	5	5	1	21
2	TREASURE ISLAND SAN FRANCISCO	8	4	3	4	19
3	ARQUES SHIPYARD SAUSALITO	7	2	3	4	16
4	BETHLEHEM YARD SAN FRANCISCO	8	2	2	4	16
5	HUNTERS POINT SAN FRANCISCO	7	2	1	4	14
6	HORSESHOE COVE FORT BAKER	4	1	2	5	12
7	PACIFIC DRYDOCK OAKLAND	2	1	2	4	8

- NOTE: 1.) SCALE FOR FACILITY POTENTIAL IS 10 DOWN TO 1  
 2.) SCALE FOR ALL OTHERS IS 5 (BEST) DOWN TO 1 (WORST)  
 3.) POINTS FOR DISTANCE (BY WATER) AS BELOW:  
     5 = 0-5 MILES  
     4 = 6-10 MILES  
     3 = 11-15 MILES  
     2 = 16-25 MILES  
     1 = OVER 25 MILES

TABLE 2





## **2.0 SITE ALTERNATIVES**

### **A. MARE ISLAND**

The Mare Island Naval facility is scheduled for closure in September 1996. Four drydocks are contained there, the most suitable being dock #1. There are four 50-ton rail cranes that operate around the docks. Both the dock and the cranes are in excellent condition. There are ample buildings adjacent to the dock, suitable for wood storage, workshops and laydown areas.

A wet berth currently used for Navy berthing barges could be used for pierside repairs. It is located immediately south of the drydock, and has power, water and other services. The channel is maintained at a 36 foot depth by the Army Corps of Engineers. The Navy has been maintaining the same depth in the approaches to the docks and along the wet berth.

The Vallejo Economic Development Council is very interested in having a group such as SFMNHP occupy this site as they are anxious to create a historic district on Mare Island with hopes of attracting visitors for tours. There is a ferry terminal adjacent to the dock which lends to this plan.

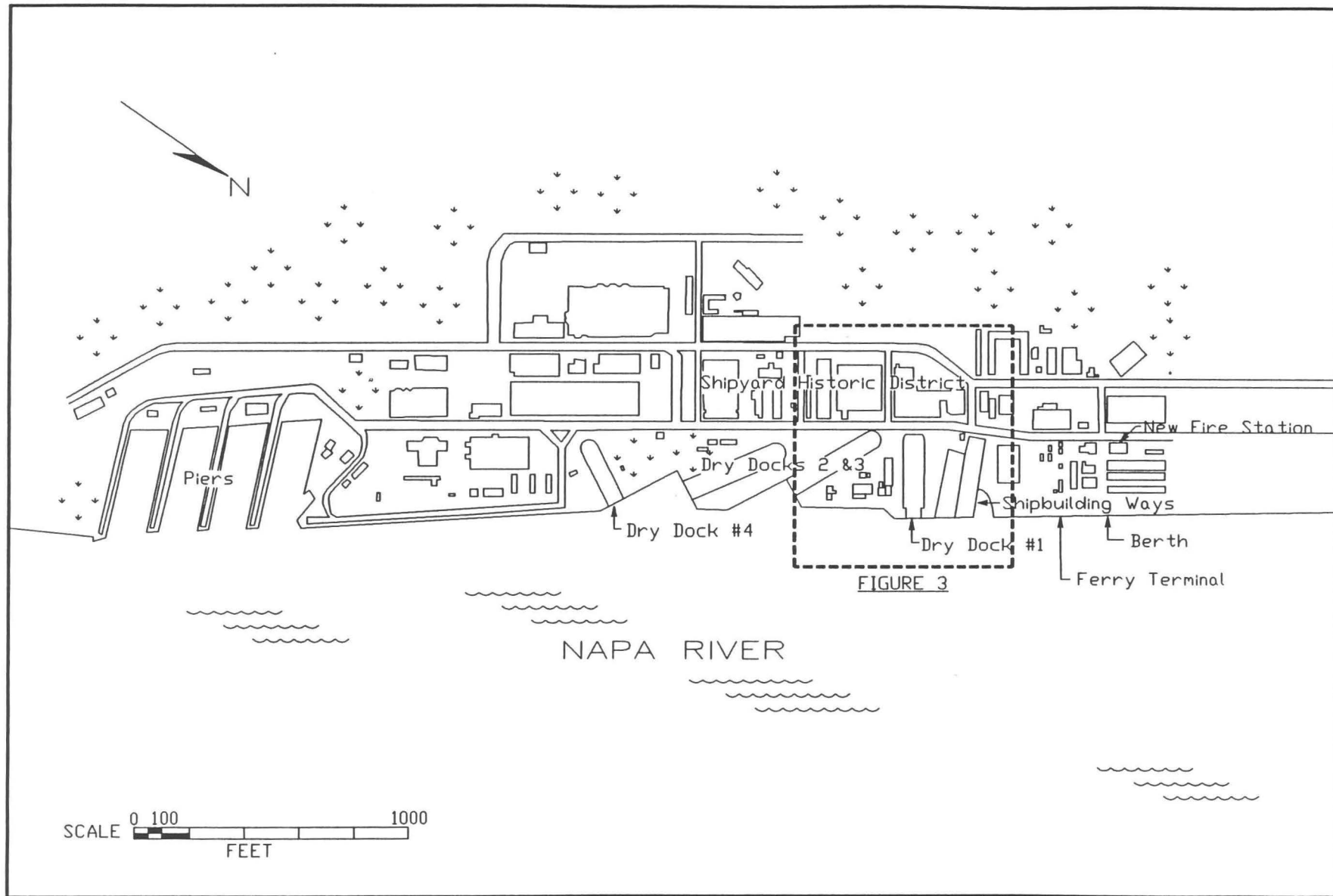
The Mare Island site is an excellent facility, meeting many of the requirements of the SFMNHP. There would be almost no startup costs and vessels could possibly be brought in for work much sooner than the 1996 closure date. The only visible drawback at this location is its distance from the Hyde Street pier; about an hour drive or a 27 mile trip by water.

#### **A.1 SITE DETAILS**

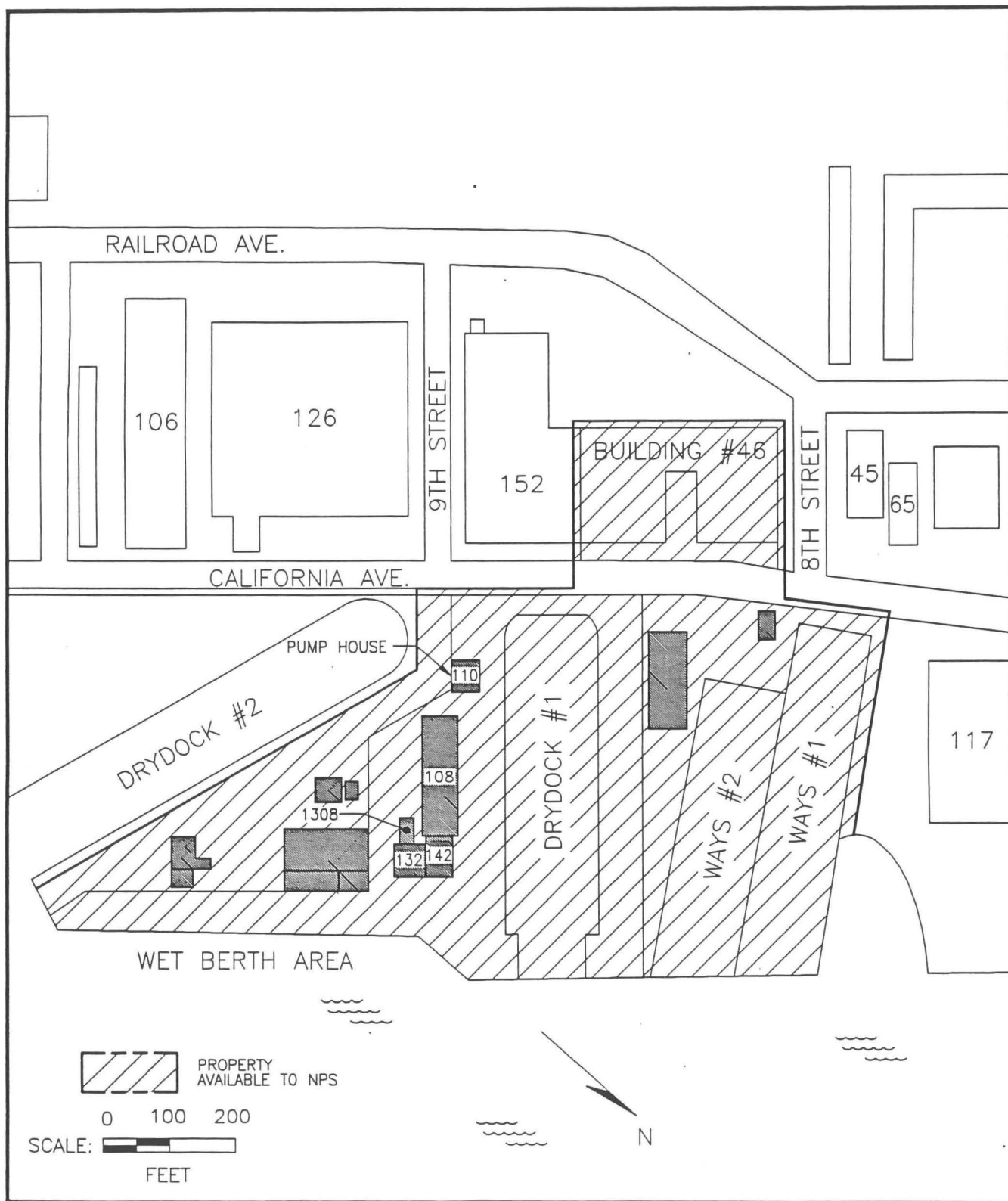
The Mare Island Naval Shipyard is located on the northeast shore of Mare Island in San Pablo Bay, north of San Francisco Bay. The shipyard is located within the incorporated boundaries of the city of Vallejo near Napa Valley. Details of the site which are of particular interest to the SFMNHP are provided in Figures 2 and 3.

#### **A.2 FACILITY ANALYSIS AND EVALUATION**

The site is ideally suited for use by the SFMNHP. Drydock #1 is large enough to accommodate all of the historic ships. The cranes are in good working condition and significant shore facilities exist, including shops, storage and office space. The historic character of the site, while not within the theme of the SFMNHP, provides a compatible environment for the restoration work planned. The drydock itself is from essentially the same period as many of the ships.



MARE ISLAND  
CURRENT CONFIGURATION  
 FIGURE 2



MARE ISLAND SHIPYARD  
CURRENT CONFIGURATION

FIGURE 3

## ZONING RESTRICTIONS

The City of Vallejo is very interested in having an organization like the SFMNHP move into Mare Island. The Mare Island Redevelopment plan has set aside sections of the island as historic districts. The SFMNHP could operate its facility within the Shipyard Historic District. The presence of the SFMNHP, from the city's point of view, would certainly add to the public interest in the site. In addition, there exists a skilled workforce which has extensive experience in wooden boat construction and repair, which could supply contract labor.

It is very likely that proposed zoning ordinances at the site will be conducive to the kind of work the SFMNHP intends to do. Should zoning regulations require adjustment, the city of Vallejo will try to accommodate the needs of the SFMNHP.

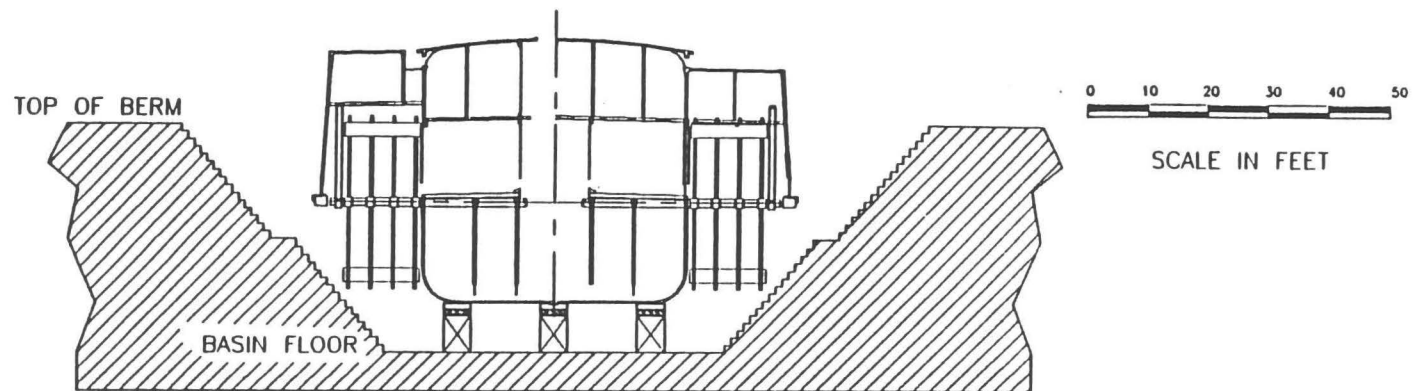
## LEVEL OF USE

The facilities at Mare Island Shipyard will allow for all levels of ship repair and maintenance. Ships would be serviced at the river front wet berth by mobile cranes for topside work and maintenance. The drydocks currently in operation at the shipyard could be used to dryberth ships and accommodate major restoration work and hull maintenance. Shore facilities are also sufficient to support all levels of wood and metal work.

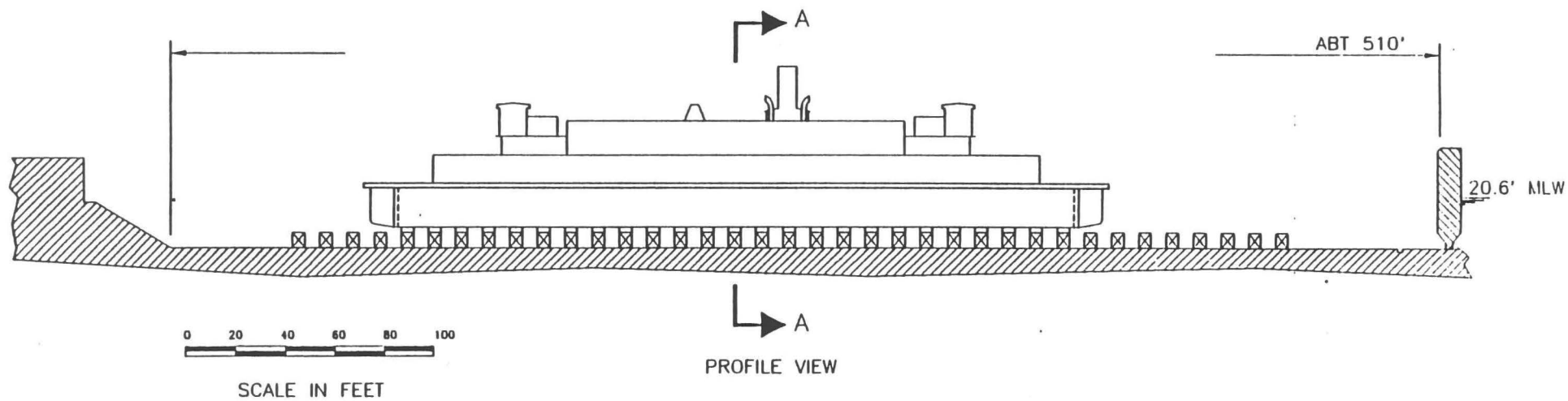
Of the four drydocks at Mare Island, Drydock #1 is the most suitable for work on the historic vessels. Completed in 1892, Drydock #1 is a historic property in itself. Unlike the newer concrete drydocks, Drydock #1 was constructed of granite blocks. It is 500 feet long by 56 feet wide at the floor and, because of its sloping walls, is 122 feet wide at the berm. Water depth over the blocks is 22 feet at U.S. Mean Low Water (USMLW). There are four 50-ton (Navy Rating) cranes on rail which can travel all around the dock. The dock and cranes are currently in excellent condition. All of the ships in the SFMNHP fleet, as well as the JEREMIAH O'BRIEN, could be serviced in Drydock #1. However, the EUREKA will require higher keel blocks (approximately 8 feet) to keep the vessel at a height where the sloping walls of the drydock will provide adequate width for the paddles.

Figures 4 and 5 show a midsection and profile of the EUREKA and the JEREMIAH O'BRIEN in Drydock #1. It can be seen from these sketches that 6' to 8' keel blocks will provide ample clearances for these vessels.

Services available at the drydock include fresh and salt water, low pressure and high pressure air, sewer and steam. The salt water fire pumps provide water at 1200 gallons per minute at 100 psi.

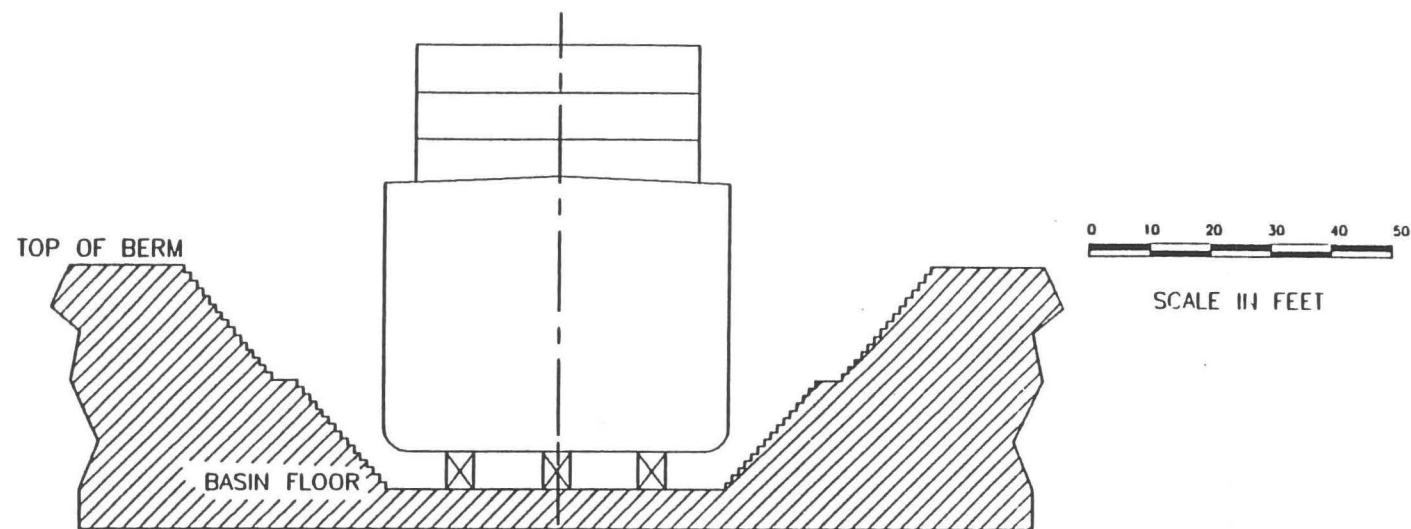


MAX SECTION SHOWN ON 8.0' KEEL BLOCKS  
SECTION A-A

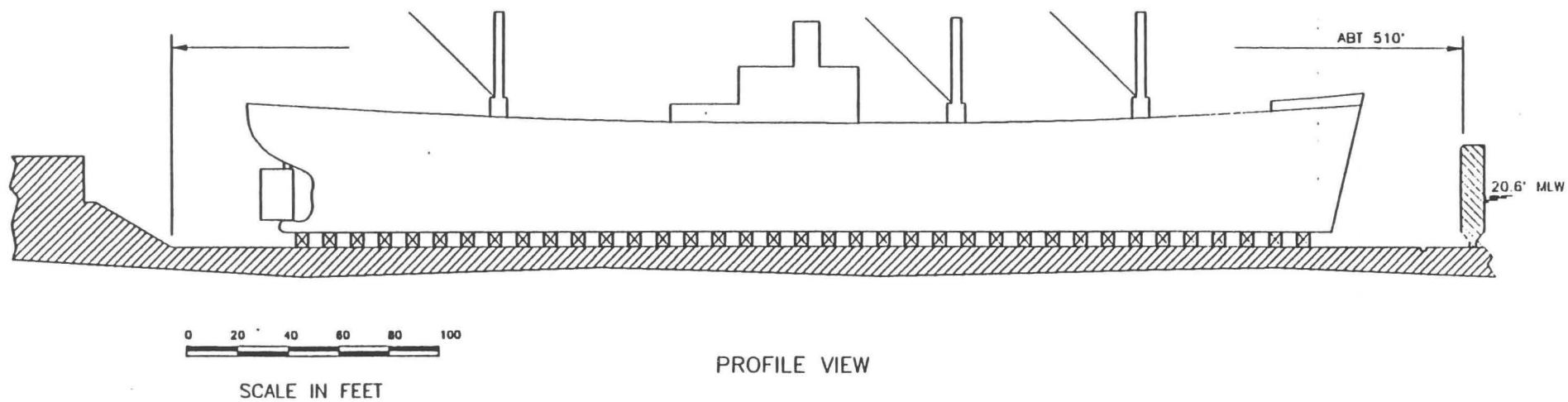


EUREKA IN MARE ISLAND DRYDOCK #1

FIGURE 4



MAX SECTION SHOWN ON 6.0' KEEL BLOCKS  
END VIEW



JEREMIAH O'BRIAN IN MARE ISLAND DRYDOCK #1

FIGURE 5

## **FEASIBILITY OF CONVERSION**

Very little would be required to convert the existing facilities to allow for use by the NPS. The drydocks and cranes are in excellent condition, and Building 46 near Drydock #1 would serve well as shop and office space. There is currently good equipment for both woodworking and metal work on the site. There will be setup costs associated with relocating equipment, machinery and tools to Building #46, but these costs will be minimal. There will be some minor capital investments in setting up office and classroom space and there may be some costs associated with providing security for the work site, depending on other re-uses planned for the remainder of the historic shipyard district.

The addition of the WAPAMA display will probably require the demolition of several buildings and the construction of a foundation. While these costs will be significant, they are comparable to those expected at other shipyard sites being considered.

The estimated costs associated with converting this facility to a fully functioning preservation/restoration facility for the NPS should be minimal when compared to the other sites. These costs are detailed in Section A.5 with the Class C cost estimate.

## **HAZMAT POTENTIAL**

Ship construction and repair activities over the past 140 years at Mare Island have resulted in the presence of hazardous materials at the facility. Mare Island has been actively building and refueling nuclear submarines for decades, so in addition to standard shipyard contaminants, there is the potential for radioactive contaminants. Much of this waste was disposed of using methods deemed unacceptable by today's standards. However, the Navy is currently responsible for assessing and remediating any problems with hazardous materials at Mare Island as part of the base closure requirements.

A number of the currently identified Installation Restoration (IR) sites at Mare Island are in the area of interest for the SFMNHP. These sites are being investigated and in some cases remediated. It should be noted that problems with some of these sites are as insignificant as chemicals stored in containers in one corner of a building. According to the Mare Island Conceptual Reuse Plan there is a problem of unexploded ordnance in the region of the drydocks. While remaining a potential concern for the SFMNHP, this again is a problem which the Navy will have to address prior to final base closure.

## **SHORESIDE FACILITIES**

In the immediate vicinity of Drydock #1 there are a number of buildings that would be very useful to the SFMNHP. These buildings could be used as both wood and metal workshops, as places to store wood and several areas are suitable for laydown areas. In Building # 46, which is the historic building closest to Drydock #1, there are a number of overhead cranes of 2-ton capacity. Access for fork trucks and other equipment through large



roll up doors is excellent.

There is a large, very well equipped carpenter shop in building #106. This shop has the capability of handling timbers up to 3ft x 3ft x 80ft long. This equipment could be acquired by the SFMNHP and relocated to the shops in Building #46. There is also sufficient space available for setting up offices and a classroom.

Figure 6 is a floor plan of Building #46 showing a proposed arrangement of shops, offices and a training classroom. Figure 7 is a proposed arrangement showing the total site after acquisition and conversion by the NPS.

Buildings #132 and #142 are newer buildings located to the south of Drydock #1 which are currently used as small shops. Building #110, located at the head of drydock #1, is the pumphouse for both #1 and #2 drydocks. Building #108, a large building to the south of the drydock that is currently used for storage, is considered a seismic hazard and should be demolished.

### **SHORESIDE ACCESS**

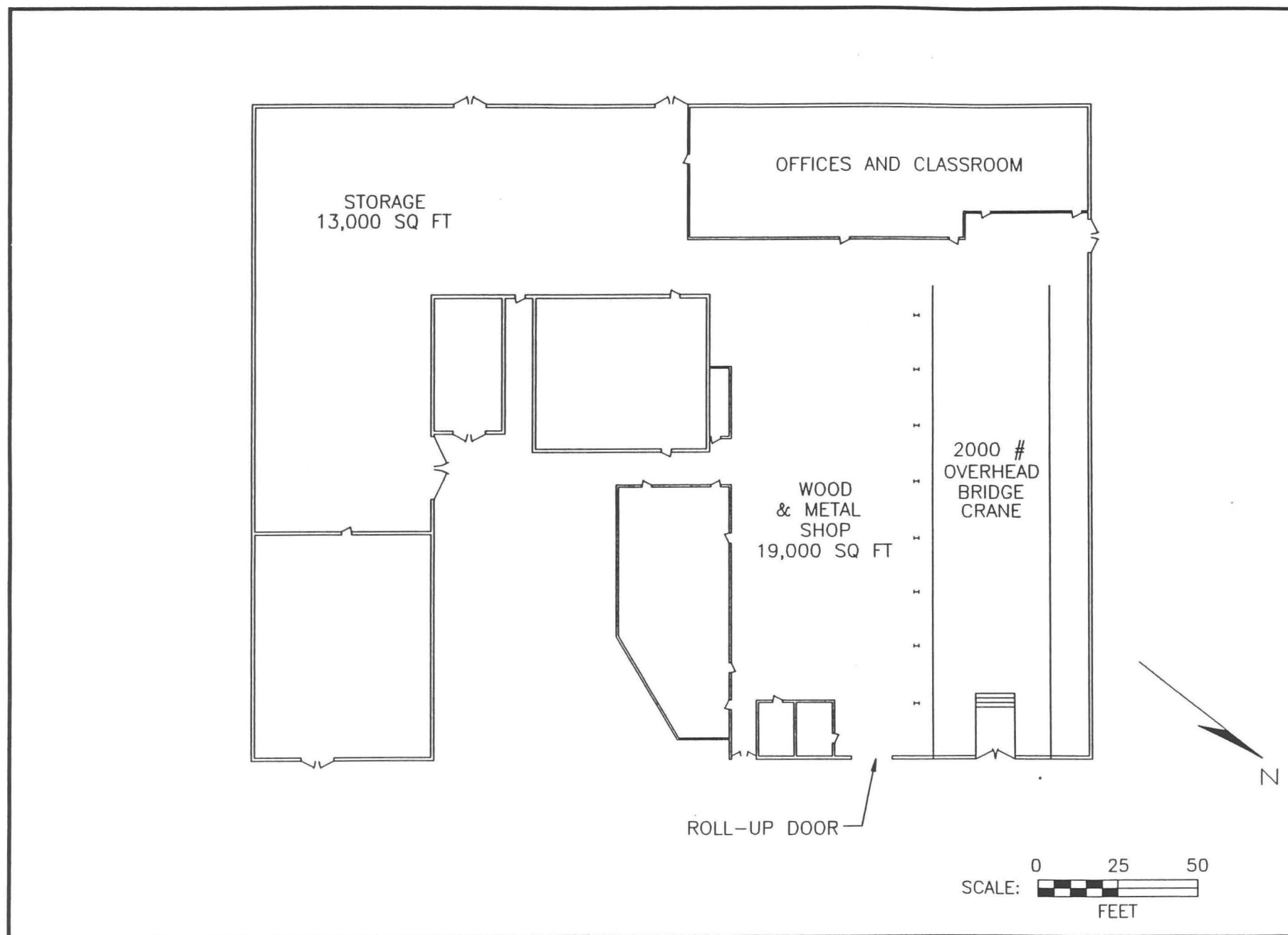
There are two primary routes onto Mare Island: State Route 37, which connects U.S. Route 101 and Interstate 80, and the bridge across Mare Island Causeway that becomes Tennessee Street in the City of Vallejo. Tennessee Street is a major artery that connects directly to Interstate 80. There are also a number of rail links onto the island that could allow for train transportation. The areas around Drydock #1 and the adjacent slip ways are all paved, providing excellent vehicle access to the entire area.

### **WATERSIDE ACCESS**

Mare Island Strait is the last stretch of the Napa River before it empties into San Pablo Bay. Consequently, there is a constant source of sediment from the river that requires frequent dredging to keep the channel open for safe navigation. The dredging of the Strait's channel is conducted by the U.S. Army Corps of Engineers on an annual basis. The shipyard currently dredges the berths, docks and finger pier areas using its own hydraulic dredge with spoils pumped to the ponds on the west side of the island. This dredging must be authorized by an Army Corps permit. The SFMNHP may be required to maintain and pay for this permit.

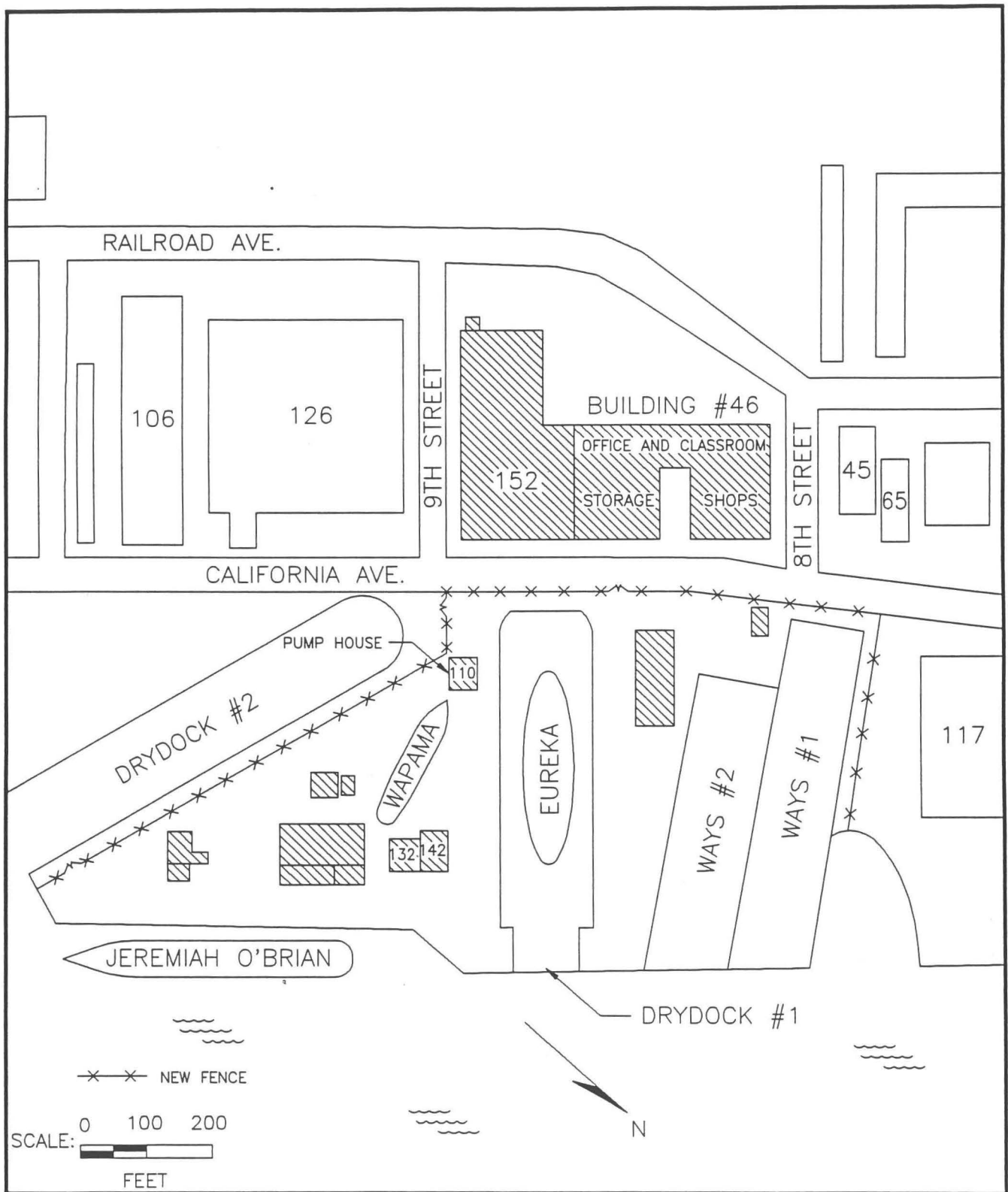
The dredging equipment is currently in excellent condition. The SFMNHP would only require dredging in the immediate vicinity of Drydock #1 and the wet berth to the South.





MARE ISLAND—BUILDING #46 FLOOR PLAN

FIGURE 6



MARE ISLAND SHIPYARD  
AFTER PARK SERVICE CONVERSION  
 FIGURE 7

## WAPAMA DISPLAY POTENTIAL

Should the decision be made to set up a dry berth display of the WAPAMA, there is ample space available, making such a display relatively easy to construct. The water is deep enough to move the barge containing WAPAMA directly up to the berth so that she could be brought ashore. Since building #108 will probably need to be demolished, that site could prove ideal for the WAPAMA. The WAPAMA is shown in this location in Figure 7.

## VISITOR ACCESS AND INTERPRETATION

Mare Island has had an active role in the U.S. Navy for the past 140 years. The site is a National Historic Landmark, and is listed on the National Register of Historic Places. The Mare Island Conceptual Reuse Plan calls for the complex to be used as a "living museum". A limited restoration of the historic buildings is anticipated, allowing conduction of facility tours.

The SFMNHP's preservation/repair facility would complement historic interpretation of Mare Island. Both the SFMNHP and Mare Island would benefit from the combination of living museum and historic ship preservation, by providing interpretive opportunities which could attract a larger base of visitors. Various levels of volunteer activities to support the restoration work could be facilitated at the Mare Island facility through the use of classrooms and workshops.

During periods when historic vessels are being restored at Mare Island, several opportunities for visitor involvement could be implemented. Advertisement could encourage visitors to travel by car to Mare Island, or visitors to the Hyde Street pier facility could be offered an expanded tour of both the ships at the pier and Mare Island. Such tours would include a water taxi to transport visitors up the bay to Mare Island for a tour of the shipyard and restoration site. There are currently several locations where a ferry dock could be set up. In addition, an extensive interpretive program of the vessels undergoing restoration could be developed. This would be extremely valuable in generating public interest and understanding of the preservation and restoration of the historic vessels managed by the SFMNHP.

This location would have the added benefit of involving residents of the northern bay area in the activities of the SFMNHP. In this way, the restoration facility could attract visitors to the Hyde Street Pier facility who otherwise might not visit.

### A.3 OPERATIONS

After completing the modifications shown in Figures 6 and 7, SFMNHP would have a mid-sized, full service drydock facility. The SFMNHP workload is only expected to be about 10% of the capacity of such a facility, especially after completion of the initial major restorations of vessels such as C.A. THAYER. Although this scenario may be 5-10 years away, this site should be converted with the intention of other marine work being performed when not in use by SFMNHP.

## MARE ISLAND OPERATIONAL ALTERNATIVES

The Mare Island facility after conversion would be ideal for operational alternative "C", management by a contractor. This facility would be an attractive commercial facility based on the condition and size of the dock and wet berths. It is also large enough that the SFMNHP would have to add a significant number of personnel to their staff for the maintenance and security of the facility. Use of alternatives "A" or "B" would essentially put the SFMNHP in the business of running a ship repair yard as well as maintaining a fleet of vessels.

It is quite likely that a contractor could readily be found who would be interested in running the facility for the SFMNHP on a long-term basis. The availability of an experienced workforce in the Vallejo area would make it relatively easy for the contractor to gather the necessary skilled workers to perform a wide mix of work on all vessel types.

It is extremely difficult to predict what the net cost to the NPS would be for this facility using alternative "C". If a reasonable level of ship activity continues in the Bay Area, the yard should be able to acquire adequate workload. Since the facility could easily be certified for Navy repair work, it would have the ability to bid on work for both commercial and small Navy vessels. With good management and no mortgage to carry, it is reasonable to expect that there would be a small annual operating profit, even after performing the necessary maintenance. In that case, the SFMNHP would have essentially no carrying costs for the facility, beyond their own administrative costs.

### A.4 SOCIO/ECONOMIC IMPACTS

The Mare Island Naval Shipyard has been employing thousands of skilled workers who either live on the base or are residents of Vallejo and its surrounding communities. The closure of the shipyard will have a significant impact on these individuals and communities. The Mare Island Redevelopment Committee is trying to lessen the damage from this closure on the region by preparing a base re-use plan for economic redevelopment.

The current draft plan designates Mare Island for a combination of industrial, commercial and residential purposes. In addition, certain areas of the Island will be designated as historic districts. These districts will be restored and managed as sites of historic interest to visitors. These, in addition to other local tourist attractions, will stimulate some business activity on Mare Island.

The inclusion of the SFMNHP should have a beneficial effect on Mare Island. The SFMNHP would insure a certain level of maritime activity at Mare Island. Drydock #1 would be preserved as a working artifact with SFMNHP and other maritime work being performed. In addition, there may be the potential for a number of the current shipyard employees to be retained as the base is redeveloped. The City of Vallejo recognizes the potential benefits of having the SFMNHP in Mare Island and appears willing to help make such an arrangement possible.

There would be no adverse socio-economic impacts created by the use of Drydock #1 as a preservation/repair facility by the SFMNHP.

## **A.5 COST ESTIMATE**

### **CONVERSION COSTS**

One of the principal advantages of Mare Island is the minimal amount of work required to convert the site into a form usable by SFMNHP. Despite its age, most of the facility is in remarkably good condition. The drydock, cranes and buildings are ready to be used and/or modified. There will be little clean up and the majority of the construction work will be modifications to Building #46 and construction of the WAPAMA display.

Construction activities required for conversion include:

- Division of Building #46 into, shop, office and classroom space. This will include the construction of non-structural internal walls, and the purchase of furniture and equipment.
- Construction or modification of keel blocks for use during the docking of the EUREKA and the JEREMIAH O'BRIEN.
- Demolition of buildings #108 and #1308.
- Construction of the WAPAMA display.
- Construction of the security fence for the site and the preparations required to facilitate tourist visitation.

### **OPERATING COSTS**

Operating costs for the Mare Island Facility would include, but not be limited to, the following items:

- Maintenance and upkeep of the buildings, equipment, and cranes.
- Maintenance and upkeep of the drydock, including the maintenance of the drydock services such as the compressed air, fire fighting, water and electrical power.
- Dredging of the area from the drydock to the channel on a periodic basis, and the maintenance of the dredging equipment.

CLASS "C" COST ESTIMATE

MARE ISLAND SHIPYARD CONVERSION  
ASSUMING FULL CAPABILITY (500' VESSEL)

TASK DESCRIPTION	No. OF UNITS	UNITS	\$\$/UNIT	COST \$\$
DEMOLITION OF EXISTING BUILDINGS				
BUILDING #108	255000	CU FT	0.40	102000
BUILDING #1308	8000	CU FT	0.40	3200
SITE IMPROVEMENTS				
PERIMETER CHAIN LINK FENCE	1720	FT	30	51600
GATES	3	EA	2000	6000
WAPAMA DISPLAY BERTH				
CONCRETE FOOTING	222	CU FT	350	77700
CRADLE (STEEL/WOOD)	20	TON	3000	60000
EQUIPMENT				
RELOCATE WOODWORKING SHOP	10	EQPTS	7000	70000
PURCH OR RELOCATE METAL WORK EQPT	5	EQPTS	40000	200000
INCL WELD, BURN, ROLL, PRESS, SHEAR				
PURCHASE & INSTALL MACH SHOP EQPT	6	EQPTS	15000	90000
FORKLIFT (5 TON) – PURCH FROM NAVY	2	EA	7000	14000
DOCK IMPROVEMENTS				
MODIFY KEELBLOCKS FOR SHIPS	120	BLOCKS	600	72000
FURNISHINGS				
OFFICE FURNITURE & EQPT	5	SETS	3400	17000
CLASSROOM FURNISHINGS & EQPT	1	SETS	5000	5000
VISITOR/INFORMATION ROOM	1	EA	2000	2000
TOTALS				\$770,500

## **B. TREASURE ISLAND**

This site consists of a relatively new pier on the southeast side of the island. It is part of the Navy base which is scheduled for closure. The concrete pier, which was constructed in 1987, is approximately 120 feet wide by 930 feet long and is in excellent shape. The pier is surrounded by 25' - 33' deep water and its fendering system consists of massive rubber covered bumpers. The pier was designed to handle large Navy vessels and services on the pier include air, 440v electric, steam and salt and fresh water.

There are service buildings adjacent to the pier which will more than adequately serve as the work space required for vessel restoration and maintenance. Building #3 is very large and has room for shops and storage. It already has office space and a classroom set up. There is also ample room for parking and mobile crane access. The location of the pier gives it good protection from the prevailing westerly winds in the summer. All that would be required is a suitable floating drydock to dryberth the vessels during hull restoration work.

This facility is quite close to the Hyde Street pier and could be an excellent possibility for a long-term site. Acquisition of the pier and part of Building #3 may be the biggest difficulty due to significant competition with the many other interests jockeying for control of the Base after the Navy leaves.

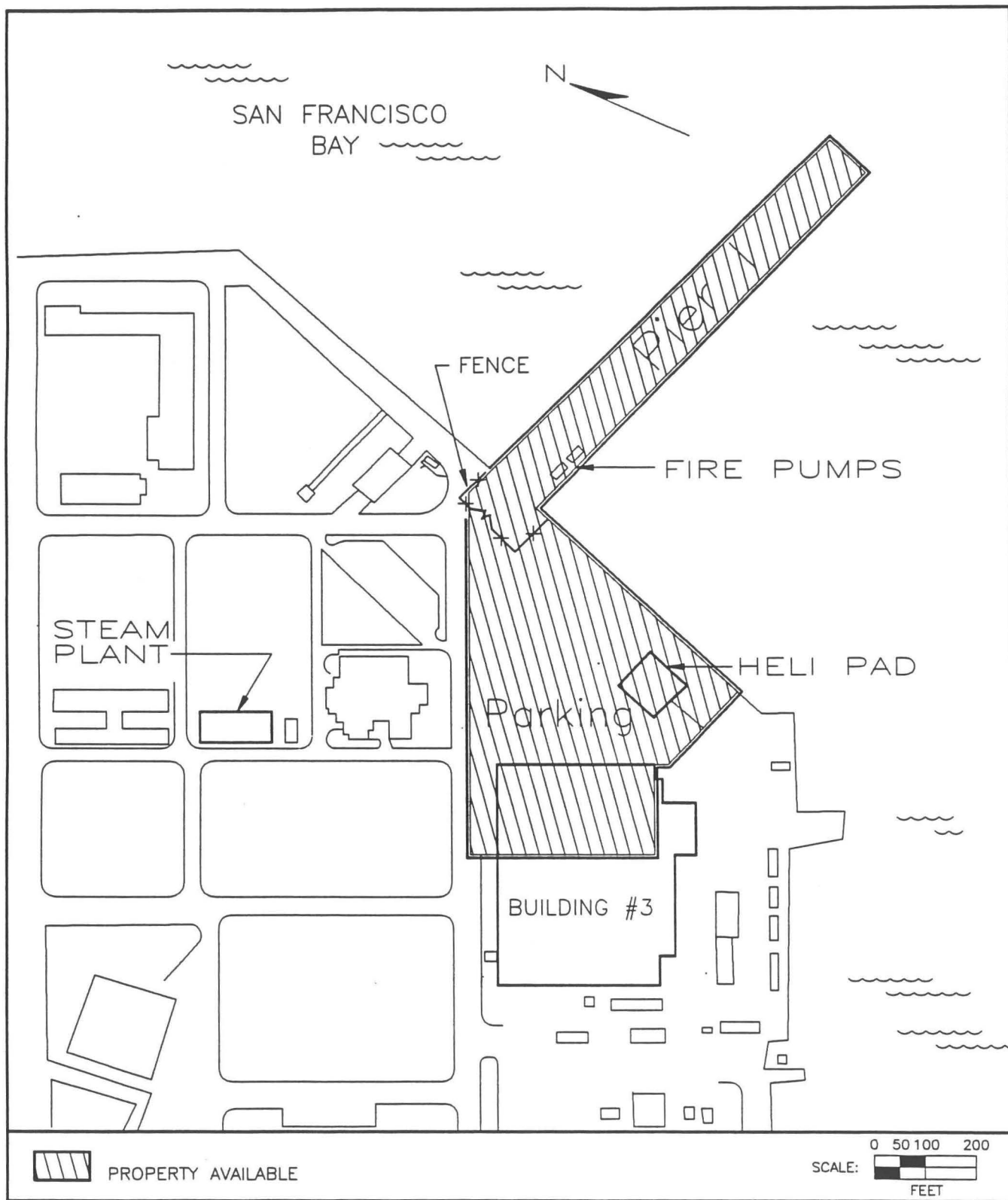
### **B.1 SITE DETAILS**

Treasure Island is scheduled for operational closure on September 30, 1997. Pier #1 and the buildings associated with it are well suited for marine repair work. The site is easily accessible and in excellent condition. There is ample space available, both outdoors and under cover. The site is shown in Figure 8.

### **B.2 FACILITY ANALYSIS AND EVALUATION**

#### **ZONING RESTRICTIONS**

It is likely that the City of San Francisco will control any future use of Treasure Island, including the development of proposed zoning regulations. Currently the pier and the immediate vicinity of the pier serve as an intermediate maintenance facility for navy vessels. It is expected that land uses developed for the island will allow continuation of similar work in the vicinity of the pier. Building #2, which is next to Building #3, has been leased to Disney Studios for movie production. This demonstrates that the City of San Francisco is willing to allocate some portions of the island for light industry use and potential lease revenue opportunities.



TREASURE ISLAND SITE  
CURRENT CONFIGURATION

FIGURE 8



At this time there are no other known parties seriously considering the acquisition of Pier #1. However, the NPS should expect serious competition for Building #3. The City of San Francisco plans to use the building as part of a 'World's Fair' type exhibit in 1999. In addition, plans include developing the island as part of a multimedia, communication and film studio 'mecca', with Building #3 figuring prominently in their plans. Consequently, if the NPS intends to use this facility they will have to begin the process for acquiring the property as soon as possible. It is also possible to construct a storage and workshop building in the parking area adjacent to the pier, should acquisition of Building #3 become unfeasible.

## **LEVEL OF USE**

Pier #1 at Treasure Island is a reinforced concrete structure which was completed in 1987 and is well suited for the operation of a large floating drydock. The level of work possible at this site would be dictated by the size of the floating drydock secured for use. The drydock currently owned by the SFMNHP, the AFDL-38, is suitable for use with the smaller vessels in the SFMNHP fleet, but could not handle the EUREKA or the JEREMIAH O'BRIEN. SFMNHP could elect to use this site with the AFDL-38 only, knowing that the two larger vessels would have to be docked at commercial yards elsewhere. For the capability of maintaining all the museum vessels, a larger dock (about 500' long) would have to be acquired and installed alongside Pier #1.

## **FEASIBILITY OF CONVERSION**

Two major work areas are required to convert this site for SFMNHP purposes. The initial work would be to repair the earthquake damage in Building #3 and modify the structure to suit the needs of the SFMNHP, including setup of the woodworking and metal shops and the purchase of equipment. Offices, classrooms and storage space would also require some limited level of setup.

The second major effort for facility conversion relates to the pier. Although the water depth at the pier is currently deep enough for berthing large vessels, dredging would be required around Pier #1 to allow for the operation of a floating drydock. The Navy has spent the last three years working on getting a permit to dredge the site, and the permit has been approved. However, the Navy no longer plans to dredge since the base closure is planned for 1997. It is likely that the permit can be transferred to a new user of the pier, since the primary delay was developing environmental impact studies for the site. Since the SFMNHP would be installing a drydock and requesting a new dredging profile, it is almost certain that new permits and an Environmental Impact Statement would be required, both for dredging and for installing the dock.

Calculations were performed (see Appendix) to estimate the amount of dredging required to create a 40' deep basin for operation of drydocks at the pier. Such a basin for the NPS drydock AFDL-38 would require dredging approximately 22,000 cubic yards of sediment. A larger drydock, with dimensions of 500 feet by 125 feet, would require dredging

about 54,000 cubic yards.

Further effort will be required to adapt the pier for use by a floating drydock. New moorings would have to be designed to meet level 3 (the most severe NAVFAC rating) earthquake loadings. Access ladders and ramps would be required to provide personnel and equipment access onto the dock. The relatively high freeboard of the pier would necessitate long and expensive ramps to keep the slope manageable. Hookups for dock power and services would also need to be installed, but could easily be connected to the existing pier utilities.

## **HAZMAT POTENTIAL**

At this time there appear to be no significant hazardous material issues related to Pier #1 or Building #3.

## **SHORESIDE FACILITIES**

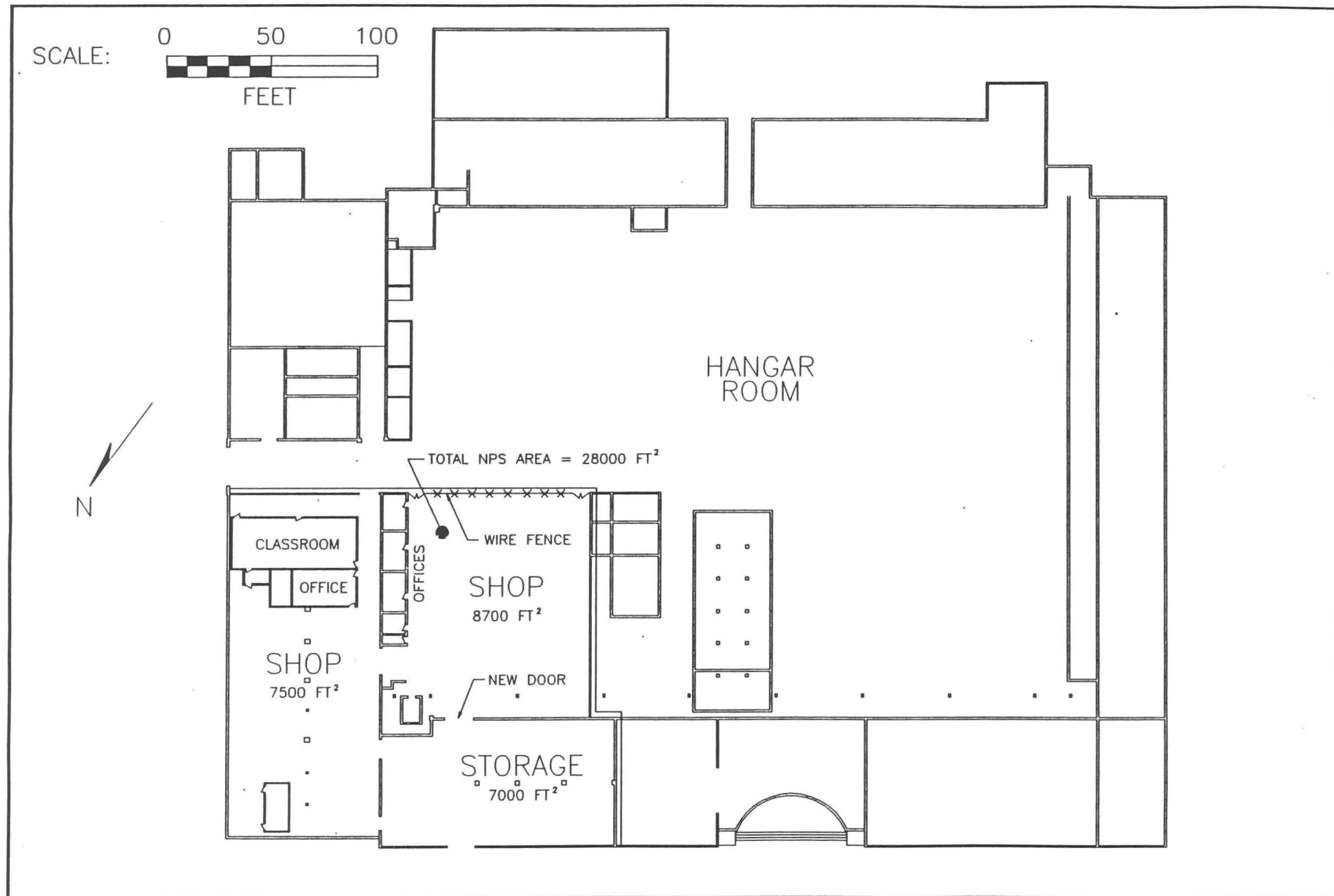
Building #3 has over 140,000 square feet of space. It is similar in appearance to a aircraft hangar building. There is a large, cavernous interior with smaller rooms along the perimeter of the structure. The interior has a concrete floor and can be accessed by trucks from outside. There are small cranes fixed to the concrete floor that are similar in size and load capacity to a crane that might be used to remove a engine from a car or truck. There is no other fixed equipment in the room. A floor plan is given in Figure 9.

Building #3 is presently used by SIMA in the north end of the building and various training centers in the south half. The Port Operation Facility Office is also located in the building. SIMA will be vacating the property in 1994. The Naval Tech Training Center and the Fleet Training Center will occupy part of the building until 1997 or 1998.

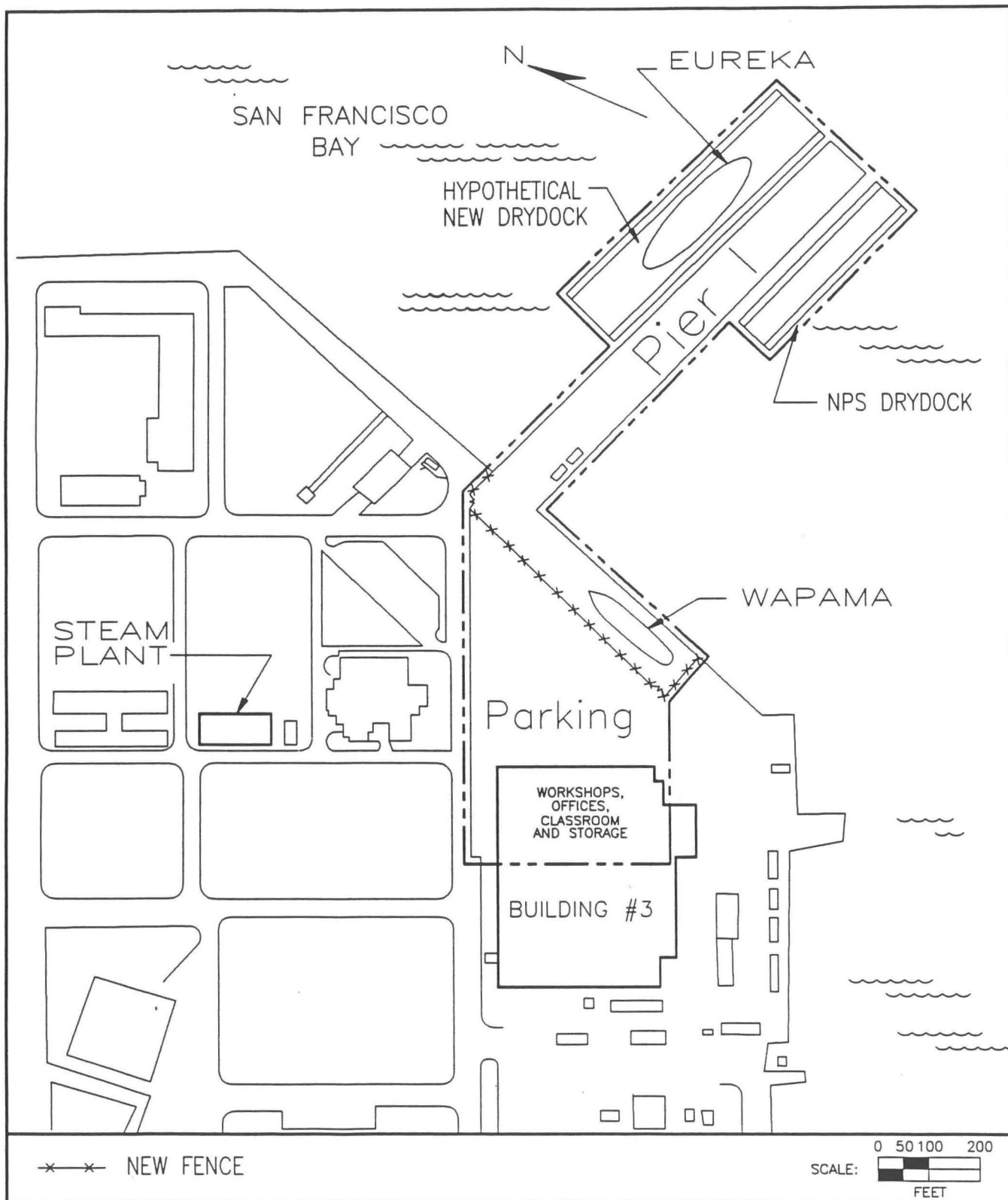
Consequently, the SFMNHP would only be able to occupy the north side of the building in the near term. On the north side of the building, near the pier, there are several offices, a classroom and several large rooms that could be used as storage space. There would be a minimal level of work needed to get these rooms into a form usable by the SFMNHP.

Building #3 was damaged in the last San Francisco earthquake. Following a survey of the damage, the Navy developed a plan to repair and modify the building with costs estimated at \$2 million. Due to the imminent base closure, the Navy will not be executing this plan. If the NPS were to acquire this building, at least some of these repairs would need to be accomplished to bring the structure up to code.

A proposed site arrangement is shown in Figure 10.



TREASURE ISLAND—BUILDING #3 FLOOR PLAN



TREASURE ISLAND SITE  
AFTER PARK SERVICE CONVERSION  
 FIGURE 10

## **SHORESIDE ACCESS**

Treasure Island is connected to both San Francisco and Oakland by the Oakland Bay Bridge. Access from the highway to the end of Pier #1 is excellent, even for large trucks.

## **WATERSIDE ACCESS**

When Pier #1 was finished in 1987, the water depth at USMLW around the pier had been dredged to 35 feet. At this time, the depth at the end of the pier is 30 to 33 feet and the depth at midpier is about 25 feet. This depth is enough to allow for the pierside servicing of all of the vessels in the NPS fleet including the JEREMIAH O'BRIEN, in a light condition.

## **WAPAMA DISPLAY POTENTIAL**

There is a large amount of available space in the vicinity of Building #3 and Pier #1, giving numerous locations suitable for dry berthing of the WAPAMA. She could be transferred to Pier #1 and then moved to her permanent dryberth, providing public access for visitor interpretation. A possible location for the WAPAMA is shown in Figure 10.

## **VISITOR ACCESS AND INTERPRETATION**

Treasure Island would be well suited for visitor interpretations. It is located very close to San Francisco and the Hyde Street Pier facility. It is currently a tourist destination due to the views of the city and the old homes on Yerba Buena Island. It is a beautiful location with ample parking and roads that are in good condition. Presently, however, few facilities exist that would support tourists, such as restaurants or hotels.

## **SECURITY**

Security should not be a problem at Treasure Island. Pier #1 currently has a 8 foot chain link fence surrounding the entrance. There is lighting in the parking area and a small guard gate at the entrance. It may be necessary to build a new fence to enclose the WAPAMA display as shown in Figure 10.

## **PREVIOUS HISTORIC USE**

Building #3 and Treasure Island itself were constructed for the 1939-1940 Worlds Fair. Building #3 was the 'Palace of Fine and Decorative Arts.' It is an Art Deco structure of historic significance and is a candidate for the State Register of Historic Places. The Navy has been treating it as if it were already on the Register and contacts the State prior to any modifications.

### **B.3 OPERATIONS**

The Treasure Island site lends itself well to two possible operating scenarios. If the site is fully developed, by bringing in a drydock capable of handling the EUREKA or JEREMIAH O'BRIEN, then Alternative "C" would be most suitable. The cost of acquiring a large drydock and putting it into service at the pier would place a heavy financial burden on the SFMNHP. Use of the dock on a regular basis for Navy or commercial work would be the only way to bring the SFMNHP's annual carrying cost to a reasonable level. In addition, the dock should be operated and maintained by a certified dockmaster.

If only the existing NPS drydock is brought over to the site, then Alternative "B" would be more appropriate. The SFMNHP staff could more easily handle the management of projects on the smaller vessels which would fit on the drydock. The carrying cost of the smaller dock would also be low enough that it would not be as necessary for the SFMNHP to generate income through utilization of the dock on a steady basis. If, however, a contractor was identified who was interested in running the Treasure Island facility with the limited capabilities afforded by the small dock, the SFMNHP should consider alternative "C".

### **B.4 SOCIO/ECONOMIC IMPACTS**

Very few of Treasure Island's indigenous population will remain after the base closes in 1997. With the City of San Francisco planning a redevelopment of the island there will likely be an influx of different types of industries with new employees. If the SFMNHP were to gain control of Pier #1 and part of Building #3, it would probably have little impact on the overall economic health of Treasure Island. However, the presence of the SFMNHP would add an element of maritime business to the island and could also employ some of the current personnel who oversee the pier and related facilities.

### **B.5 COST ESTIMATE**

#### **CONVERSION COSTS**

As discussed earlier, there will be a significant cost associated with converting the Treasure Island site into a facility usable by the SFMNHP as a preservation and repair facility. Although the facility is in very good condition, a number of repair and modification costs would be necessary, including the following:

- Repair of earthquake damage to Building #3.
- Modification of Building #3 for shops and offices.
- Acquisition of tools and equipment for the shops.
- Modifications to Pier #1 such as the service hookups, construction of ramps for the drydock, and the acquisition of forklifts. Cranes could be leased on an as-

needed basis.

- Acquisition of a floating drydock or the relocation of the existing NPS Drydock AFDL-38.
- Permit and Dredging costs around Pier #1

## **OPERATING COSTS**

There would be a number of costs associated with the operation of the site. These costs would include:

- Dredging costs around Pier #1.
- Maintenance costs of the Pier and Building #3.

CLASS "C" COST ESTIMATE

TREASURE ISLAND CONVERSION

ASSUMING FULL CAPABILITY (NEW DRYDOCK)

TASK DESCRIPTION	No. OF UNITS	UNITS	\$\$/UNIT	COST \$\$
RENOVATION OF BUILDING #3 BASED ON TOTAL COST OF \$2M, ASSUME NPS REQMTS @ 30% OF TOTAL	1	LOT	600000	600000 0
SITE IMPROVEMENTS				
PERIMETER CHAIN LINK FENCE	735	FT	30	22050
GATES	1	EA	2000	2000
WAPAMA DISPLAY BERTH				
CONCRETE FOOTING	222	CU FT	350	77700
CRADLE (STEEL/WOOD)	20	TON	3000	60000
EQUIPMENT				
PURCHASE & INSTALL WOODWORKING EQPT INCL SAWS, PLANERS, DRILLS, ETC.	10	EQPTS	10000	100000
PURCHASE & INSTALL METAL WORK EQPT INCL WELD, BURN, ROLL, PRESS, SHEAR	5	EQPTS	40000	200000
PURCHASE & INSTALL MACH SHOP EQPT	6	EQPTS	15000	90000
FORKLIFT (5 TON) – PURCH NEW	2	EA	10000	20000
CRANE (20 TON)	1	EA	LEASE AS	REQUIRED
DOCK IMPROVEMENTS				
PURCHASE USED 18,000 TON DRYDOCK	1	EA	4000000	4000000
DREDGING TO 40' FOR DRYDOCK	54000	CU YD	12	648000
ADD RAMPS, MOORINGS, HOOKUPS, ETC.	1	EA	750000	750000
ADD KEELBLOCKS FOR SHIPS	120	BLOCKS	1000	120000
FURNISHINGS				
OFFICE FURNITURE & EQPT	5	SETS	3400	17000
CLASSROOM FURNISHINGS & EQPT	1	SETS	5000	5000
VISITOR/INFORMATION ROOM	1	EA	2000	2000
TOTALS				\$6,713,750

NOTE: FOR FACILITY CONVERSION WITH INSTALLATION OF NPS DRYDOCK AFDL38 INSTEAD OF NEW DOCK, COST FOR DOCK IMPROVEMENTS = \$1.08M vs \$5.518 ABOVE, GIVING A TOTAL COST OF \$2,274M FOR THE LESS CAPABLE FACILITY.



## C. ARQUES SHIPYARD

The Arques Shipyard site, located in Sausalito, was once part of a Liberty Ship construction yard. It is presently occupied by a clutter of small businesses with multiple small buildings. There are three abandoned launching ways which have been converted to marine railways. These appear capable of hauling small vessels (powerboats up to 50') and have a maximum width of about 60'. The nearest navigable channel to the site ends at the Army Corps of Engineers facility about a quarter of mile away. The maximum depth of the approach to Arques is about 10 feet, with shallower water near the slips. The land is in a trust which is dedicated to supporting marine activities. The trust is interested in providing a long-term lease for part of the property to the SFMNHP with assurances that it would continue as a marine facility.

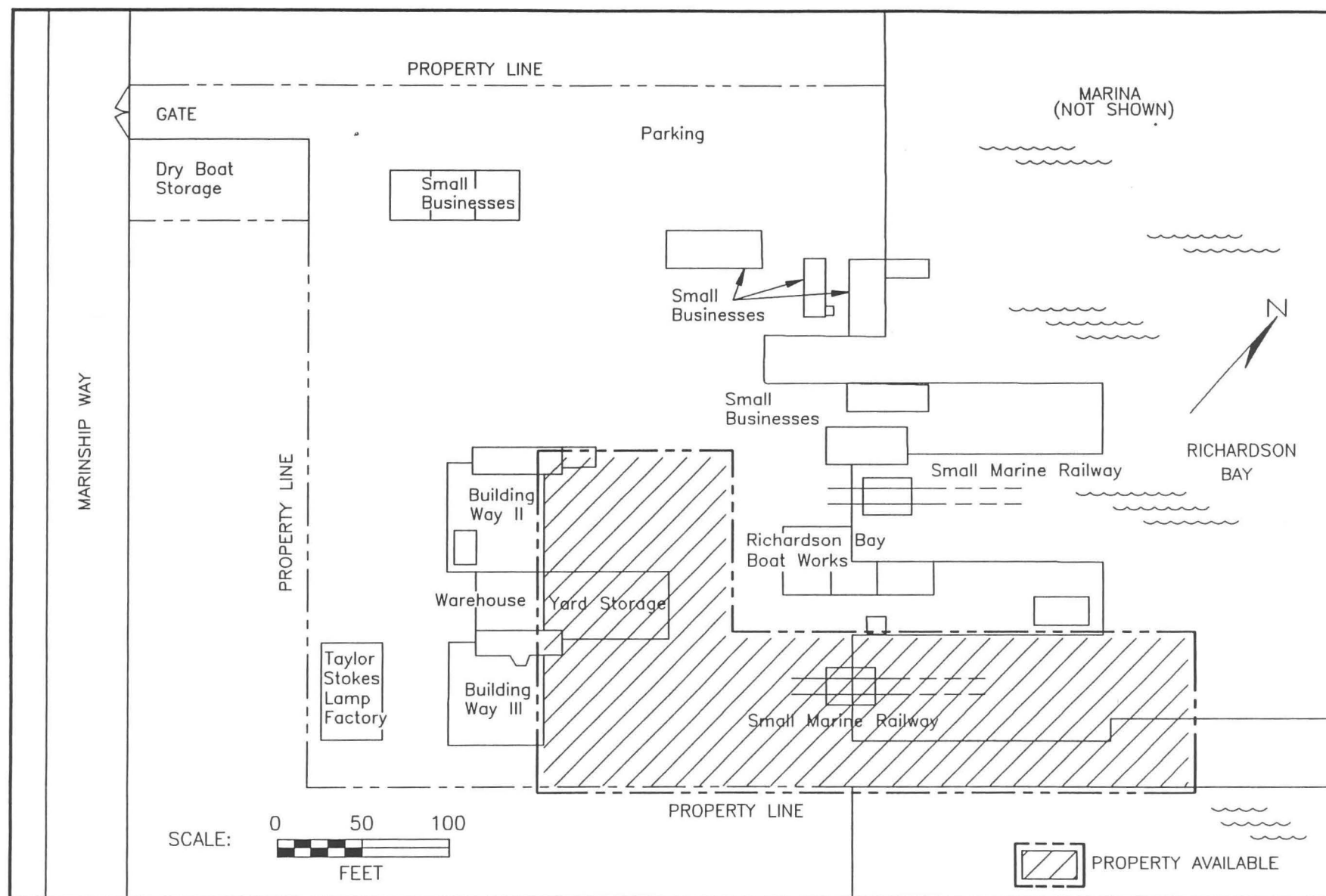
This site is relatively close to the Hyde St. pier, but is not currently set up to service the larger vessels in the museum fleet. With significant upgrades and dredging it could be made useful for vessels up to the size of the C.A. THAYER. However, it is unlikely that the site could be developed to allow for vessels the size of the BALCLUTHA or EUREKA to be hauled out. In addition, the small amount of space which would be available to SFMNHP would prevent undertaking larger projects.

The present owner of the facility is currently preparing a master development plan which may affect any future involvement by the SFMNHP. However, the trust is very interested in having the SFMNHP as a tenant and would be willing to include them in the development plan.

### C.1 SITE DETAILS

This site is well-suited for small vessel restoration activities. During World War II, this area was a shipyard that built Liberty ships and T-2 tankers. At that time, the entire area was known as MarinShip. It is currently being used as a construction site for concrete houseboat foundations, as a repair facility for wooden ships and as a marina for recreational craft.

The land is located within the City of Sausalito. It is about a 15 minute drive from the Hyde Street pier via the Golden Gate Bridge. By water, the site is approximately five miles from the Hyde Street pier. It is in a tourist-oriented part of the bay with other marine-related sites located nearby. This site is shown in Figure 11.



ARQUES SHIPYARD  
CURRENT CONFIGURATION  
 FIGURE 11

## **C.2 FACILITY ANALYSIS AND EVALUATION**

### **ZONING RESTRICTIONS**

Currently the site is zoned by the city of Sausalito for marine work and light industry. According to the MARINSHIP Specific Plan prepared by the City of Sausalito Planning Department in May of 1989, the Arques Shipyard was mentioned as follows:

"This parcel is large, has remained in a single ownership for many years, and with its water access, represents the greatest remaining opportunity in the Marinship to create a significant marine service center. The development objective for this parcel is that it be used for a mixed-use development concept focusing upon industrial and art uses, especially those oriented to, and complementary to, marine services. Its central Marinship location, as well as the potential for significant amounts of industrial and arts uses, justifies such additional uses as commercial services and food services."

The zoning classifications and the MarinShip Specific Plan are consistent with the usage which SFMNHP would have for this land, and would likely be supported by the city of Sausalito.

### **LEVEL OF USE**

Not all of the Arques Shipyard site is being made available to the National Park Service. The area offered is less than an acre and is essentially the old building way #3 from the MarinShip site. This was a construction slip used to make the Liberty ships and tankers. It is badly deteriorated, with only a portion of the original way still intact. However, the site does have straight access to the harbor with no interference from the marina.

If the site were completely redeveloped it would be possible to do all types of maintenance or restoration work at this site. A new slip with rails, winch and cradle could be used to haul ships for work. A new pier could be constructed for topside repairs with mobile cranes on the pier or a floating crane pulled alongside. There are no existing buildings included in the site, so all shops, offices and storage space would have to be constructed. Since the amount of space is somewhat cramped compared to the other sites it will be necessary to combine the shops, offices and storage in a new, two story building.

The site may be most useful when handling some of the smaller boats such as the THAYER. It may be more economically feasible to convert the site to handle the smaller boats and then contract out the work for the larger vessels like the EUREKA.

### **FEASIBILITY OF CONVERSION**

A possible configuration for the converted site is given in FIGURE 12. An extensive

amount of work would need to be done to convert the site to a form usable for the SFMNHP. The existing concrete slip would need to be surveyed to determine its current condition. The wooden pier to the south of the site would need to be demolished and a new pier built. Submarine pilings in front of the slip would need to be removed, as would the brush and light trash on the site. The SFMNHP would need to lengthen the slip, install new rails, cradles, and a hauling winch. A building for shops, offices, storage and a classroom would have to be built.

At best, the developed facility would be a site that could allow for the wet berthing of the BALCLUTHA at the new pier, and the dryberthing of the smaller ships such as the THAYER. About 106,000 cu. yd. of dredging (see Appendix) would be necessary to get the BALCLUTHA to the site. A channel, including a turning basin, would need to be dredged from the Army Corps of Engineers channel to the site. The channel would have to be dredged to 25 feet to allow passage of the BALCLUTHA and several years of silting. A lesser amount of dredging would be required if no vessel larger than the THAYER was ever to be brought to the site, and such transfers were timed to take full advantage of the tides.

The owners of the Arques Shipyard intend to have a wooden boat building school on the site. Such a school would require woodworking shop space, tools and classrooms. Careful coordination between the SFMNHP and the shipyard could result in the most economical construction by using certain facilities jointly between the Arques school and the SFMNHP.

## **HAZMAT POTENTIAL**

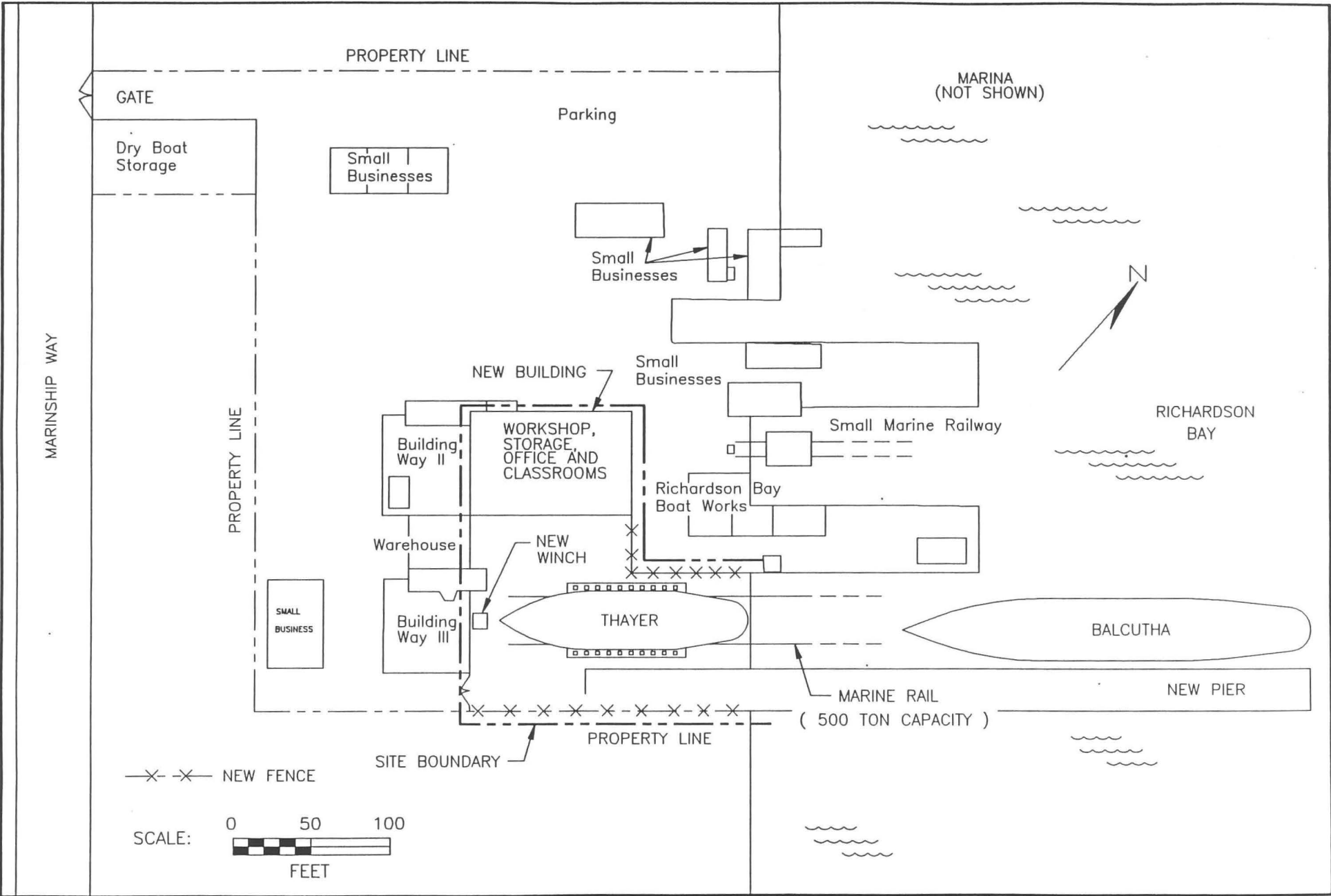
At this time there is no known problem with hazardous materials at the site. However, past usage of the site could easily have resulted in accumulation of "normal" levels of industrial contaminants in the ground adjacent to the building ways. This level of contamination should not be problematic for continued industrial usage envisioned by the Park Service.

## **SHORESIDE ACCESS**

This site can be easily accessed either through the city streets of Sausalito or from Route 101. Route 101 is only a few blocks away, allowing large trucks a convenient access to the site.

## **WATERSIDE ACCESS**

Once the dredging is completed, the site will be accessible by water from the Richardson Bay channel. Maintenance dredging will be required frequently because the City of Sausalito has an easement which allows a storm drain to empty onto the property. This has resulted in rapid accumulation of silt in front of the launching ways.



ARQUES SHIPYARD  
AFTER PARK SERVICE CONVERSION  
FIGURE 12

## **WAPAMA DISPLAY POTENTIAL**

The limited amount of space being offered at the Arques Shipyard precludes the relocation of the WAPAMA to a dry berth on shore.

## **VISITOR ACCESS AND INTERPRETATION**

The Arques Shipyard could be developed to attract visitors and facilitate volunteer involvement in the ship restoration process. Were the site to be developed as planned by the Arques trust, there would be numerous attractions for visitors, including the planned wooden boat school at the shipyard and the possible relocation of the Sausalito museum to the site. In addition there are a number of other attractions nearby, such as the Army Corps of Engineers San Francisco Bay Model, and the numerous restaurants and shops in the city.

### **C.3 OPERATIONS**

#### **OPERATIONS**

The property cannot be purchased by the SFMNHP; however, the Arques trust appears willing to arrange for a long term lease at the site. There are a number of different companies that could operate at the Arques site once it is converted, particularly small, marine-related businesses.

The wooden boat school which is planned for the site would complement the SFMNHP facility well. Classrooms and possibly even the shop space could be shared.

Operational alternative "B" would make the most sense for the Arques site once it is completed. The SFMNHP would acquire a long-term lease for the facility. When work was being performed on the museum vessels, the SFMNHP staff would manage the operation of the facility, overseeing maintenance and the ship work. The majority of the ship work would be performed by subcontractors. During extended periods of inactivity on the museum fleet, the SFMNHP staff could arrange for other parties such as the wooden boat school or any of the other small companies in the area to "rent" the facility for work on their own vessels/projects. This work would be performed by the renter's workforce under his own supervision, although some oversight by the SFMNHP staff would be required to ensure the facility was not abused.

### **C.4 SOCIO/ECONOMIC IMPACT**

The City of Sausalito is interested in increasing the number of enterprises involved in marine related light industries. The SFMNHP would be a welcome addition to the city and community. The Arques Trust is also eager to have a facility like the SFMNHP preservation and repair facility on its property. This SFMNHP facility would complement the wooden boat school that they have planned, and would employ a number of local workers and help maintain

the existence of maritime skills in Sausalito.

## **C.5 COST ESTIMATE**

### **CONVERSION COSTS**

There will be a significant cost associated with constructing a facility at the Arques site that would allow for the haulout of vessels the size of the THAYER and the pierside work on vessels the size of the BALCLUTHA.

Some of this work includes:

- Demolition of the existing pier and small structures on the site. Removal of light trash and debris.
- Renovation and modification of the existing slip to allow for the hauling out of vessels the size of the THAYER. This would include a new concrete slab, addition of new marine rails, cradle and winch.
- Construction of a new pier to wet berth vessels the size of the BALCLUTHA and strong enough to allow for the operation of small mobile cranes.
- Construction of a new, two story building (~9000 ft<sup>2</sup>) to house the wood and metal shops, offices, storage and a classroom.
- Capping of the site with asphalt or concrete and the addition of a security fence.
- Dredging to the Army Corps channel to provide access to the site.

### **OPERATING COSTS**

Operating costs for the Arques would result from, but not be limited to, the following:

- Maintenance and upkeep of the buildings, equipment, and marine railway.
- The maintenance dredging of the area from the slip to the channel.
- Costs associated with permanent NPS staff at the site (If operational alternative "B" is selected)



CLASS "C" COST ESTIMATE

ARQUES SHIPYARD CONVERSION

ASSUMING CAPABILITY UP TO 500 TON VESSEL

TASK DESCRIPTION	No. OF UNITS	UNITS	\$/UNIT	COST \$
REMOVAL OF EXISTING STRUCTURES				
PIER DEMOLITION	1	EA	70000	70000
REMOVE SUBMARINE PILINGS IN SLIPWAY	1	LOT	10000	10000
SITE IMPROVEMENTS				
PERIMETER CHAIN LINK FENCE	130	FT	30	3900
GATES	1	EA	2000	2000
CLEANUP SLIP & ADJACENT SITE	0.65	ACRE	11000	7150
ADD CONCRETE SURFACE FOR WORK AREA	683	SQ YD	85	58055
BUILD NEW PIER @ 280' LG	8750	SQ FT	75	656250
WAPAMA DISPLAY BERTH	N/A			0
EQUIPMENT				
PURCH & INSTALL WOODWORKING EQPT	10	EQPTS	10000	100000
PURCH & INSTALL METAL WORK EQPT	5	EQPTS	25000	125000
INCL WELD, BURN, ROLL, PRESS, SHEAR				
PURCHASE & INSTALL MACH SHOP EQPT	6	EQPTS	12000	72000
FORKLIFT (2 TON)	1	EA	5000	5000
CRANE (20 TON)			LEASE AS	REQUIRED
DOCK IMPROVEMENTS				
DREDGING FROM SLIP TO CHANNEL	106485	CU YD	12	1277820
500 TON MARINE RAILWAY				
CONCRETE RAMP + EXT UNDERWATER	1333	SQ YD	115	153295
RAILS AND SUPPORTS	1	LOT	200000	200000
HAULING CRADLE & KEEL SUPPORTS	1	LOT	300000	300000
HAULING WINCH & CHAINS	1	LOT	150000	150000
NEW BUILDING CONSTRUCTION				
ADMIN & CLASSROOM AREAS	1500	SQ FT	165	247500
SHOP SPACES	3000	SQ FT	135	405000
STORAGE AREAS	3000	SQ FT	135	405000
FURNISHINGS				
OFFICE FURNITURE & EQPT	5	SETS	3400	17000
CLASSROOM FURNISHINGS & EQPT	1	SETS	5000	5000
VISITOR/INFORMATION ROOM	1	EA	2000	2000
TOTALS				\$4,271,970

## **D. BETHLEHEM STEEL YARD**

The Bethlehem Steel site is contained in the facility operated by the San Francisco Drydock. It consists of an abandoned building way at the inshore (west) end of the facility. There is one set of standing concrete and wooden launching ways which are in fair shape above the high water line, but are badly rotted outboard. Two old cranes, now stripped out, are on rails adjacent to the ways. There are several buildings near the slipway which are large enough for NPS requirements but are currently empty and in need of repairs.

This location is relatively convenient to the Hyde Street pier being only 15-20 minutes away by car. It is currently in need of serious upgrades and repair, but could be made into a serviceable site. The adjacent areas are heavily industrialized and almost as run down. Environmental cleanup will be a problem due to past industrial usage of the property.

### **D.1 SITE DETAILS**

This site is located at the intersection of Twentieth and Illinois Streets in the City of San Francisco. It used to be the Bethlehem Steel yard and is now owned and managed by the Port of San Francisco. The site is currently being leased by Southwest Marine and is being used by San Francisco Drydock for ship repair work. A small portion of this site is potentially available to SFMNHP and is shown in Figure 13.

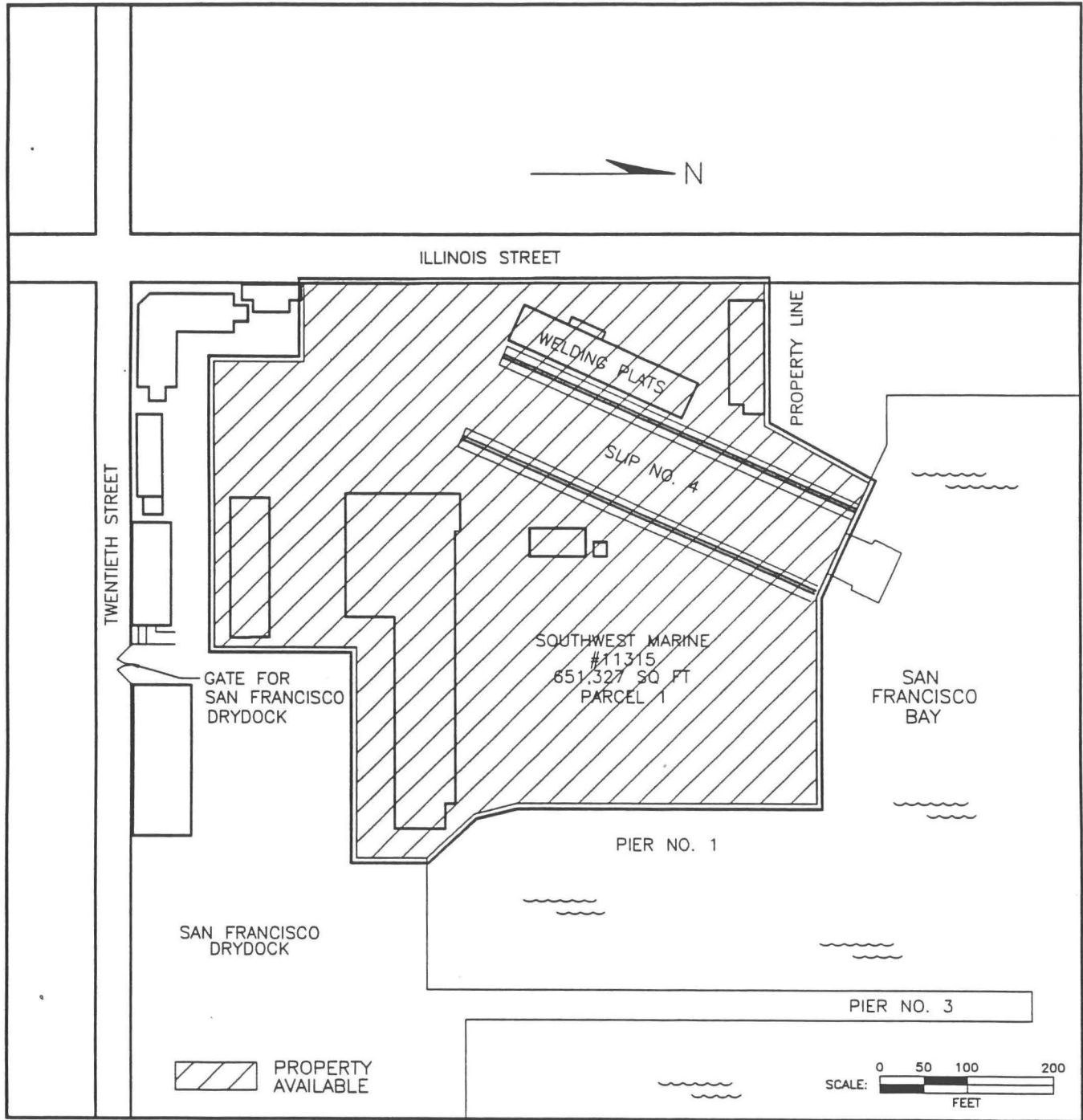
The site includes an old slip, some buildings and over 600,000 square feet of land. It has over 800 feet of frontage on Illinois Street, and is also adjacent to several buildings that have historical site status, one of which was the former offices for the Port of San Francisco.

Existing buildings on the site have enough square footage to satisfy all SFMNHP needs. However, the existing buildings are in questionable shape and would require restoration. The largest building has over 20,000 square feet on the ground floor. It used to be a forge shop and was designed to support light overhead rail cranes. This building currently has no walls and the roof may be in need of repair. The interior is filled with old, dilapidated equipment and the dirt floor is contaminated with hazardous materials including asbestos.

### **D.2 FACILITY ANALYSIS AND EVALUATION**

#### **ZONING RESTRICTIONS**

This location is currently zoned for marine use. It is adjacent to several other marine related businesses and a recreational marina. The land can be used in a manner consistent with the intentions of the SFMNHP.



BETHLEHEM SHIPYARD  
CURRENT CONFIGURATION

FIGURE 13

## **LEVEL OF USE**

Slip #4 would be the primary means by which the ships could be hauled from the water at this site. It is approximately 100 feet wide and a little over 500 feet long. With the addition of a 2000-ton capacity marine railway and adequate cradle, all of the SFMNHP vessels up to the EUREKA could be handled at this location. Some dredging of the channel from the deep water to the slip would be required.

If the site was fully developed, it would be possible for a full range of work to be performed. Topside work could be performed at the Pier 1, and there is sufficient room at the site for the construction of small offices, classrooms and a dry berth for the WAPAMA. There are existing buildings that could be renovated for use as metal and wood working shops.

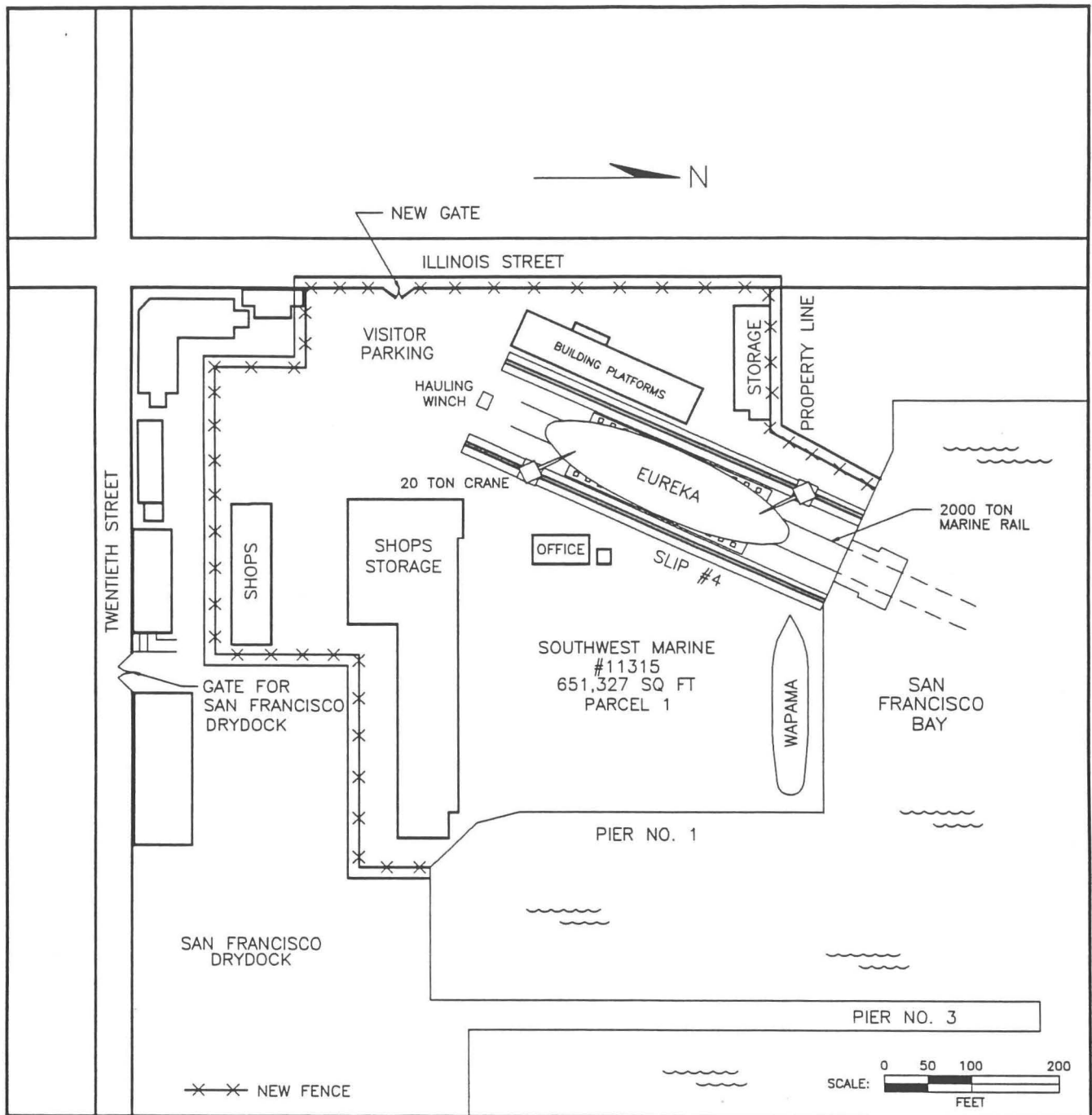
## **FEASIBILITY OF CONVERSION**

If SFMNHP wishes to utilize this site for restoration and maintenance of all its vessels up to and including the EUREKA, extensive upgrades would be required. The main shop building would have to be refurbished, including repairs to the roof, cleanup of hazardous materials on the dirt floor, and addition of some walls and a partial floor. The concrete and timber launching ways on slip #4 would have to be removed. A 2000-ton marine railway could be installed in the slip, with a suitable cradle for the EUREKA and BALCLUTHA.

One potential problem with installing a railway for a deep draft vessel such as BALCLUTHA is the long length of rail required to get sufficient water over the cradle. This adds expense, not only for the rail installation, but also for the dredging required. A more economical alternative would be installation of a 500-ton railway instead, leaving the haulout of BALCLUTHA and EUREKA to be done next door at San Francisco Dry Dock or at other commercial facilities.

The two existing 40-ton tower cranes are probably not worth rebuilding. A better approach would be purchase of two used 20-ton cranes, possibly self-powered, if the electric service to the rails is not serviceable.

Dredging (about 29,000 cu. yd.) would be required to allow the larger vessels access to the slip. The area around Pier #1 is currently dredged to allow for large ship and drydock operations. Figure 14 shows the Bethlehem Steel yard if the SFMNHP were to convert the site into a preservation/restoration facility.



BETHLEHEM SHIPYARD  
AFTER PARK SERVICE CONVERSION

FIGURE 14

## **HAZMAT POTENTIAL**

The land immediately around and including Slip #4 is probably contaminated with hazardous materials normally associated with a shipbuilding facility. The soil in the old forge building is contaminated with asbestos.

The Port of San Francisco (Jennifer Sobol, Property Manager) recommended that the entire site be capped with concrete or asphalt. This would allow the property to be used without having to dispose of the hazardous waste. The Port of San Francisco also recommended grading the site with the spoils from the dredging. This would eliminate the need to dispose of the spoils in a more costly way and eliminates the need to grade the site by disturbing the existing soil. In addition, according to the Port of San Francisco, if any construction site moves more than 50 cubic yards of soil then a Phase 1 environmental impact study must be performed. Moving the dredge spoils within the site may prevent such a study from being required.

## **SHORESIDE FACILITIES**

Although there are a number of structures on the site, they all need refurbishing before they could be made usable by the SFMNHP. The 20,000 square foot building southeast of the slip could be renovated for use as workshops, and the 3,000 square foot building immediately east of the slip, next to the power station, could be renovated as office space and a classroom. There is another 7,000 square foot building on the northwest corner of the lot that is currently used by San Francisco Drydock for storage. This could be used instead by the SFMNHP for storage.

East of the slip is an approximately 80,000 square foot expanse of grass that could be used for an outdoor storage yard and a dry berth display for the WAPAMA. Parking for visitors and staff could be arranged immediately south of the slip with direct access to Illinois Street to the west.

## **SHORESIDE ACCESS**

There is currently good access to the site through San Francisco Drydock's gate on Twentieth Street. However, the parcel is directly adjacent to Illinois Street and an alternate entrance to the site would be more practical. Large trucks and flatbeds would have no difficulty in accessing the site.

## **WATERSIDE ACCESS**

Access to the site by water is potentially very good. The slip is about 300 feet from channels currently dredged by San Francisco Drydock for their operations between Pier #1 and Pier #3. Approximately 29,000 cubic yards of sediment would need to be dredged to make the site usable by the SFMNHP. There is a recreational marina that potentially could interfere

with the positioning of the larger vessels prior to being hauled at Slip #4. However, the Port of San Francisco felt that if portions of the marina did interfere they could be easily relocated, since the Port controls the areas of interest.

### **WAPAMA DISPLAY POTENTIAL**

Immediately east of Slip #4 there is an ~80,000 square foot parcel of land that could be used as a dry berth display of the WAPAMA. This piece of property is adjacent to the pier, facilitating the transfer of the vessel to the land. The actual site is somewhat irregular, with small hills and pits, and would need to be graded and paved.

### **VISITOR ACCESS AND INTERPRETATION**

With a good design and implementation, this site could be made accessible and interesting for visitors interested in the restoration of historic vessels and interpretation of the WAPAMA. This site is an active shipyard in an industrial area of the city. Visitors will be within visual range of the San Francisco Drydock operations, and those interested in maritime topics will find this appropriate and interesting. However, the site is not in a tourist-oriented neighborhood. The area is industrial and somewhat dilapidated. There are virtually no restaurants and other support facilities for visitors adjacent to the site, but such facilities exist within a five minute drive on Illinois Street.

### **SECURITY**

According to San Francisco Drydock, the cranes and slip are stripped of wiring because vandals were stealing anything of value, including copper wire. Considering the value of the tools needed for ship restoration and the nature of the neighborhood, security will be a concern.

When completed, the site should have a perimeter fence to keep unwanted visitors out at night and to prevent daytime visitors from wandering over to San Francisco Drydock. In addition, night lighting and an alarm system or security patrol would be advisable.

## **D.3 OPERATIONS**

### **OPERATIONS**

According to the Port of San Francisco this site is currently being considered as an important part of a long term redevelopment plan of the area. The historic buildings nearby are to be restored. However, if the SFMNHP was interested a long-term lease the Port of San Francisco is willing to negotiate. Ownership of the land is not considered an option.

The operating option that makes the most sense for the Bethlehem Steel site is Operational Alternative "C". The NPS would maintain a long term lease for the facility, but turn management over to a reliable contractor. This contractor would maintain the facility and



perform all the work on the NPS vessels. When there is no NPS work to be performed, the contractor could perform other work and operate in the same manner as any other commercial yard. This operational alternative would allow the SFMNHP to minimize its involvement in the day-to-day operations of a large shipyard facility. In addition, it would help reduce the operational costs to be borne by SFMNHP.

#### **D.4 SOCIO/ECONOMIC IMPACTS**

Neither the Port of San Francisco nor San Francisco Drydock appear very interested in having the SFMNHP at Bethlehem Steel yard, despite the fact that both could benefit financially from such an arrangement. This particular site is not seen as the best spot for a tourist-related enterprise.

The area immediately around the site would see negligible impact from the presence of the SFMNHP at the Bethlehem Steel yard. The volume of work and number of visitors would not be sufficient to change the look and feel of this area. Instead, the activities would be absorbed and lost behind the heavy industrial nature of the vicinity. Tourist restaurants and shops, which are also needed to entice a steady flow of visitors, would not survive without added attractions nearby.

#### **D.5 COST ESTIMATE**

##### **CONVERSION COSTS**

There will be substantial costs associated with constructing a facility at the Bethlehem Steel site that would allow for the haulout and wet berthing of vessels the size of the EUREKA. An additional problem at this site is the presence of hazardous materials. The Port of San Francisco feels that this problem can be bypassed by simply dumping potentially contaminated dredge spoils on the property and then capping the entire site with asphalt or concrete. In theory, this would contain any hazardous materials and also prevent the environmental studies that could result in more costly ways of developing the site. However, the SFMNHP should consider a much more in-depth study of the hazardous material problem at the site before considering using the Bethlehem Steel yard, since more adoption of environmentally restrictive rulings by local agencies could greatly increase the cost of this site.

The modifications and costs associated with converting this site into a form usable by the NPS include:

- Dredging of about 29,000 cubic yards of sediment and the dumping and grading of the dredge spoils on the site.
- Installation of storm water runoff system and the capping of the entire site with a layer of asphalt or concrete.
- Renovation of Slip #4 including the demolition of the current launching ways

and the installation and repair of the utilities, marine rails and hauling winch.

- Purchase and installation of two 20-ton rail cranes on the site.
- Construction of new buildings or renovation of the existing buildings on the site for use as shops and offices.
- Installation of the WAPAMA display.
- Installation of a new security fence and the construction of a new entrance to the facility on Illinois Street.
- Purchase of wood working and metal working tools for the shops.

### **OPERATING COSTS**

Operating costs for the Bethlehem Steel site would involve, but not be limited to, the following items:

- Maintenance and upkeep of the buildings, equipment, and slip.
- The occasional dredging of the area from the slip to the San Francisco Drydock facility.
- Costs associated with permanent NPS staff at the site (For maintaining the WAPAMA)

CLASS "C" COST ESTIMATE

BETHLEHEM STEEL YARD CONVERSION

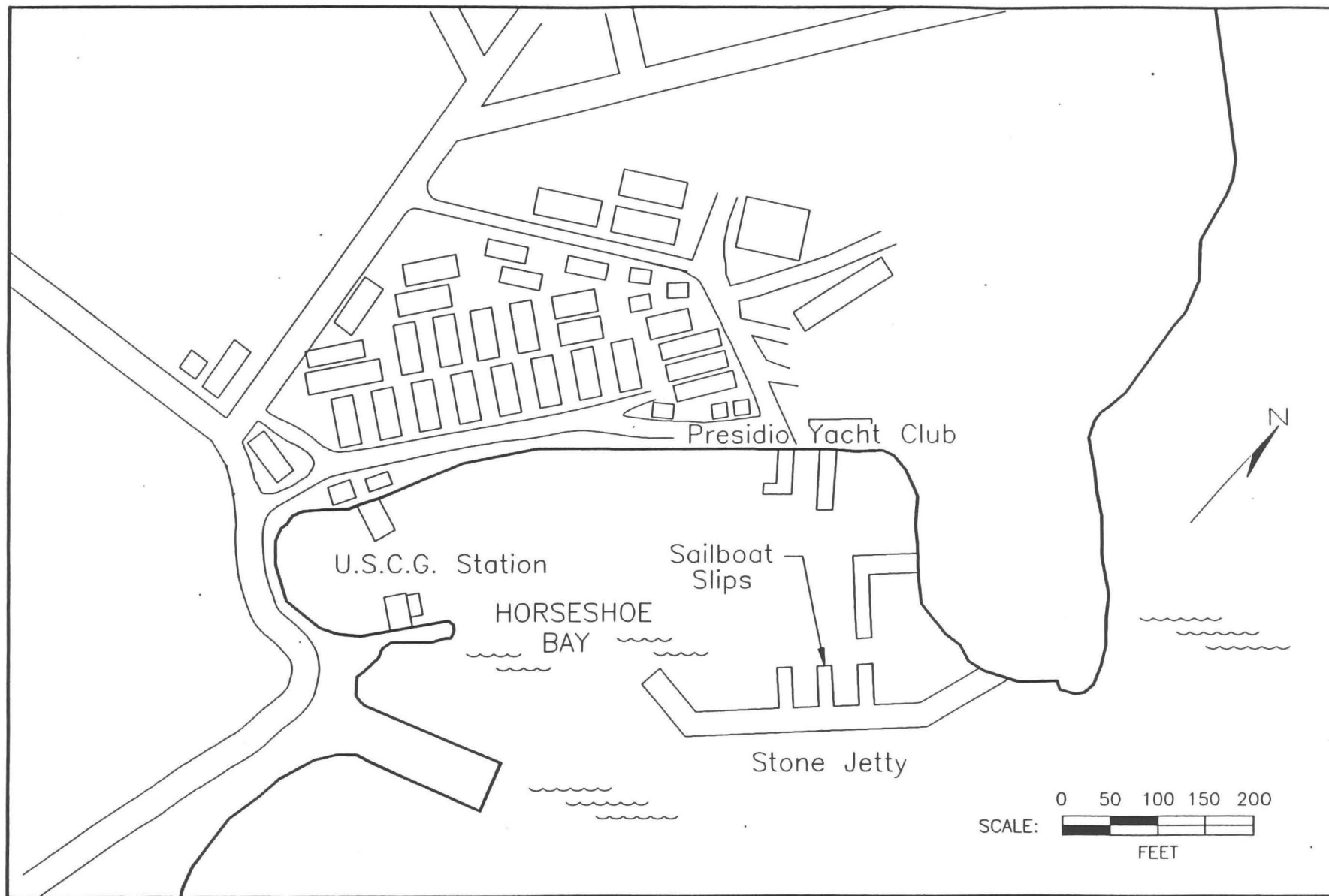
ASSUMING CAPABILITY UP TO 2000 TON VESSEL

TASK DESCRIPTION	No. OF UNITS	UNITS	\$/UNIT	COST \$\$
CLEANUP/REMOVALS FOR EXISTING SITE				
REMOVE EXISTING LAUNCH GEAR IN SLIP	1	LOT	70000	70000
CLEANUP OF ADJACENT SITE AREAS	14	ACRE	11000	154000
SITE IMPROVEMENTS				
PERIMETER CHAIN LINK FENCE	1500	FT	30	45000
GATES	2	EA	2000	4000
LIGHTING & SECURITY SYSTEM	1	LOT	60000	60000
CLEANUP SLIP & ADJACENT SITE	0.65	ACRE	11000	7150
BASE GRADING WORK & DISPLAY AREA	20000	SQ YD	8	160000
ADD ASPHALT (4") SURF FOR WORK AREA	100000	SQ FT	2.5	250000
WAPAMA DISPLAY BERTH				
CONCRETE FOOTING	222	CU FT	350	77700
CRADLE (STEEL/WOOD)	20	TON	3000	60000
EQUIPMENT				
PURCH & INSTALL WOODWORKING EQPT	10	EQPTS	10000	100000
PURCH & INSTALL METAL WORK EQPT	5	EQPTS	40000	200000
INCL WELD, BURN, ROLL, PRESS, SHEAR				
PURCHASE & INSTALL MACH SHOP EQPT	6	EQPTS	15000	90000
FORKLIFT (2 TON)	1	EA	5000	5000
TOWER CRANES (20T) ON RAILS - USED	2	EA	150000	300000
DRYDOCKING IMPROVEMENTS				
DREDGING FROM SLIP TO CHANNEL	28900	CU YD	5	144500
ASSUMES SPOILS DEPOSITED NEARBY				
500 TON MARINE RAILWAY				
CONCRETE RAMP + EXT UNDERWATER	3000	SQ YD	135	405000
RAILS AND SUPPORTS	1	LOT	980000	980000
HAULING CRADLE & KEEL SUPPORTS	1	LOT	1450000	1450000
HAULING WINCH & CHAINS	1	LOT	875000	875000
SHOP BUILDING IMPROVEMENTS				
ADMIN & CLASSROOM AREAS	1500	SQ FT	165	247500
ADD CONCRETE FLOOR	1470	SQ YD	85	124950
FURNISHINGS				
OFFICE FURNITURE & EQPT	5	SETS	3400	17000
CLASSROOM FURNISHINGS & EQPT	1	SETS	5000	5000
VISITOR/INFORMATION ROOM	1	EA	2000	2000
TOTALS				\$5,833,800

#### **E. HORSESHOE COVE**

Shown in Figure 15, this site is located immediately west of the North end of the Golden Gate Bridge in the Golden Gate National Recreation Area. This facility consists of a small cove protected by a partial stone jetty enclosure. There is a very small USCG station in the cove with a short pier. There is also a set of floats and pilings with slips for about 25-35 small boats. The only haulout facility is a short railway that belongs to the Presidio yacht club. This club is reserved for active or reserve members of US Army. There is a shed which could be used for some light work, but the building is too low and the doors too small for any serious work. The sheet pile along the shore is rusted and needs repair. There is deep water in the Bay outside the cove, but the water near the entrance to the perimeter bulkhead is only 20 feet deep. Near the hauling rail, the water is only 6'-8' deep at low tide.

By water, this site is only 3 miles away from the Hyde St. pier. However, little else is attractive about it. There is no existing capability for this site to serve as a repair facility for any of the vessels in the National Park Service (NPS) fleet. The weather is not particularly conducive to ship work since these are often strong, cold winds that whip around the Golden Gate. Dredging, pier construction and the construction of shore facilities would be required for even minor work to be performed on a ship. A significant capital investment would have to be made in Horseshoe Cove before it could satisfy the needs of the SFMNHP for a repair facility. In addition, the current tenants have long-term leases.



HORSE SHOE COVE

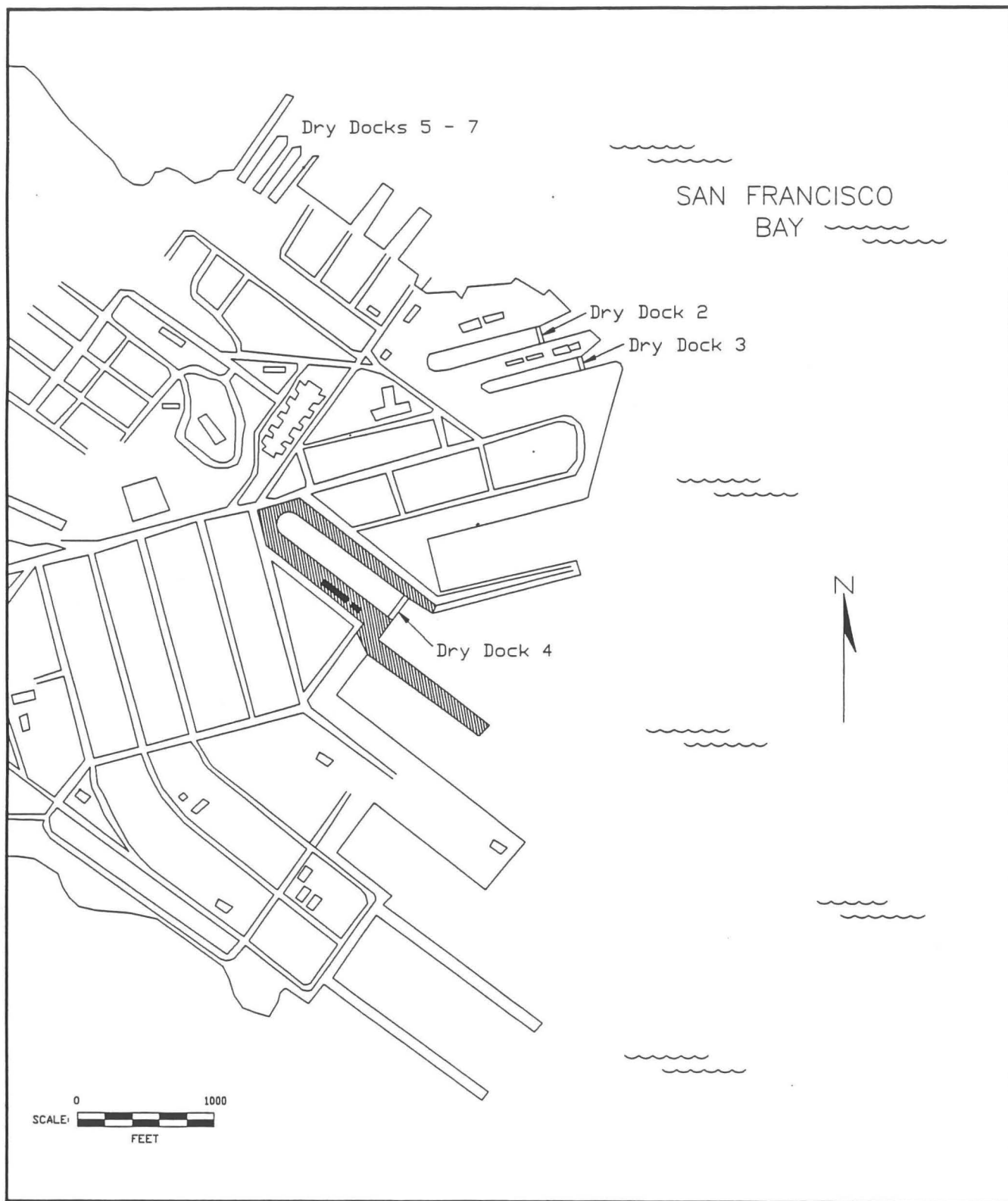
FIGURE 15

## F. HUNTERS POINT

Shown in Figure 16, this site is located in the City of San Francisco, immediately north of Candlestick Park. Hunters Point is a former Naval shipyard which is virtually empty at present and scheduled for complete closure in the near future. There are possible National Park Service (NPS) sites at graving docks #2, #3 and #4. All three docks are very large, the smallest being 600' by 120' by over 30' deep. The #2 and #3 docks were full of water, but the appearance of the exposed portions was not encouraging. The concrete keelblocks on the berm were badly spalled and the top blocks rotted and checked. A shipwright's building near dock #3 appeared in serviceable condition. The crane rails were removed along the south side of dock #3. A 70 ton crane (non-working) was stationed near dock #2. The pump house for docks #2 & #3 was itself a historic artifact worthy of attention. The electric motors drive three main pump units through a fiber rope and pulley system. Their capabilities for service are not known, though the electrical system appeared in reasonable shape.

Dock #4 is the largest dock and is currently empty. Several ships from the Ready Reserve Fleet are berthed nearby. No cranes were visible, and closer inspection was not possible since the enclosing fence was locked. There were several large buildings alongside the dock, one of which is reputed (Steve Canright) to have an excellent woodworking shop.

The Hunters Point site is surrounded by run down property with a bad reputation. Environmental cleanup could be a major problem. The facilities are in need of serious repair before any work could start on the museum vessels. In addition, the facilities are much larger than required and would result in serious maintenance costs over the long run.



HUNTER'S POINT

FIGURE 16



**G. PACIFIC DRYDOCK**

The 5,500 ton floating drydock (AFDL-38) that belongs to the SFMNHP used to be moored at this site. Pacific Drydock is located on the Oakland inner harbor estuary near Alameda. However, the drydock AFDL-38 is now leased by the SFMNHP to Mr. Bill Elliott, a local shipwright who has previously done work on the ships in the museum collection. He has moved it to a new location in Oakland.

This move was necessary in part because of the damage at Pacific Drydock from the last earthquake. The cranes are in very bad shape; during the earthquake they jumped the track and twisted. The building and the piers were also badly damaged, and the piers have subsequently been condemned.

The site is currently leased by Pacific Drydock from the Port of Oakland. The 20 year lease is due to expire in 1996-97. Currently the only work being performed at the site is some tugboat engine repair. This operation is expected to move in about a year, and then the equipment at the site is to be auctioned off.

Pacific Drydock currently has very little to offer as a potential restoration site.

### 3.0 COMPARISON OF SITES

In the final comparison of the different sites, only the sites that received detailed or moderate studies will be considered. They are compared according to the following criteria: setup costs, the level of work that each site permits, the aesthetic and historic appeal of each site and the distance of the site from the National Park Service (NPS) Hyde Street pier facility.

The setup costs given in Table 3 are from the cost estimates that were performed for each of the moderate and detailed studies. These cost figures are a simplification of the actual cost study that divides costs into three categories: dredging, site preparation and construction and equipment. Dredging costs are simply the costs associated with providing a means of access to the NPS vessels by water. The site preparation and construction costs include costs of demolition, cleanup and construction of facilities required by the NPS, such as shops and storage space. Equipment costs are expenses related to the purchase, relocation and repair of equipment required for restoration work, such as wood working equipment, cranes and floating drydocks.

The sites were ranked based on the total conversion cost, adjusted for the net capability. The highest total cost was given a score of 1 and the lowest total cost was given a score of 10. Values of total cost in between were ranked by linear interpolation. These values were then multiplied by a factor based on capability, with full capability = 1.0, 2000 ton capacity = 0.80 and 500 ton capacity = 0.50.

**SETUP COSTS (\$\$)**

AVERAGE SCORE	SITE NAME & LOCATION	INITIAL DREDGING	SITE PREPARATION & CONSTRUCTION	EQUIPMENT	CONVERSION COST TOTAL
10	MARE IS. NAVY YARD FULL CAPABILITY	0	324,500	446,000	770,500
6	TREASURE ISLAND W/NPS DRYDOCK	264,000	785,750	1,224,250	2,274,000
1	TREASURE ISLAND FULL CAPABILITY	648,000	785,000	5,280,000	6,713,750
2	ARQUES SHIPYARD 500 TON CAPABILITY	1,277,820	1,888,850	1,105,300	4,271,970
2	BETHLEHEM YARD 2000 TON CAPABILITY	144,500	1,274,300	4,405,000	5,833,800

**TABLE 3**

For Example, Bethlehem Yard gets a score of 2.3 for cost alone, multiplied by 0.80 for capability, giving 1.8 which rounds up to 2.0.

Table 4 ranks the sites according to the level of work that can be performed at each site. This is an attempt to demonstrate how some of the sites are more capable than others at performing work on the NPS vessels. The level of work assumes that the sites have been converted according to the setup costs given in Table 3.

Table 4 has four categories to demonstrate the capability of each site. The first is Pierside Work that provides the number of vessels in the NPS fleet that can be serviced at pierside at the facility. The JEREMIAH O'BRIEN is included as one of the ships. The Dryberthing category again gives the number of NPS vessels that can be dryberthed at that particular site. The next category is Shop and Storage Space which is the square footage of area available for storage and shops. The amount of space required according to Reference (1) is 3,000 ft<sup>2</sup> of shop space and 3,000 ft<sup>2</sup> of storage. The last category is the Site Size, which is the total number of acres of the site.

#### LEVEL OF WORK

AVERAGE SCORE	SITE NAME & LOCATION	PIERSIDE WORK # OF VESSELS (SCORE)	DRYBERTHING # OF VESSELS (SCORE)	STORAGE & SHOP SPACE ~ft <sup>2</sup> (SCORE)	SITE SIZE ~ACRES (SCORE)
5	MARE IS. NAVY YARD FULL CAPABILITY	7 (5)	7 (5)	32,000 (5)	7 (5)
4	TREASURE ISLAND W/NPS DRYDOCK	7 (5)	5 (3)	23,000 (5)	11 (5)
5	TREASURE ISLAND FULL CAPABILITY	7 (5)	7 (5)	23,000 (5)	11 (5)
2	ARQUES SHIPYARD 500 TON CAPACITY	5 (3)	4 (2)	6,000 (2)	0.65 (1)
5	BETHLEHEM YARD 2000 TON CAPACITY	7 (5)	6 (4)	39,000 (5)	15 (5)

NOTE: The ranking is based on the following criteria. For Pierside work, a 5 is earned if all of the Park service vessels can be serviced, including the JEREMIAH O'BRIEN but not including the WAPAMA. For every vessel that can not be serviced a point is deducted. The same scoring system is used for the Dryberthing.

For Storage and Shop Space a score of 1 is given for each 3000 ft<sup>2</sup> available up to a maximum score of 5. A similar system is used for Site Size. Each acre earns a single point with maximum score of 5.

The final ranking is the average of each score rounded to the nearest unit.

**TABLE 4**

Table 5 gives the final comparison of the sites. The rankings according to setup costs and level of work are repeated alongside rankings according to the historic and aesthetic appeal of the site and the distance of the site from the NPS Hyde street pier facility.

The Aesthetic and Historic Appeal ranking considers the sites' importance in maritime history as well as the sites' ability to be a pleasant place for tourists to visit. Mare Island and Arques both get high rankings because of their historical significance and the fact that both sites are in regions where a tourist industry is already in place or under development. Treasure Island loses points because of the lack of any maritime history to the site, but it earns some points for currently being an attractive location and because of the likely possibility that it will be developed in the near future to support tourists. Bethlehem Steel loses a number of points because of the poor neighborhood and lack of any tourist infrastructure in the area.

#### FINAL SITE COMPARISON

SITE RANK	SITE NAME & LOCATION	SETUP COSTS	LEVEL OF WORK	AESTHETIC & HISTORIC APPEAL	DISTANCE HYDE ST	TOTAL SCORE
1	MARE IS. NAVY YARD FULL CAPABILITY	10	5	5	1	21
2	TREASURE ISLAND W/NPS DRYDOCK	6	4	3	4	17
4	TREASURE ISLAND FULL CAPABILITY	1	5	3	4	13
3	ARQUES SHIPYARD 500 TON CAPACITY	2	2	5	5	14
3	BETHLEHEM YARD 2000 TON CAPACITY	2	5	3	4	14

NOTE:

- 1.) SCALE FOR SET UP COSTS FROM TABLE 3:
- 2.) SCALE FOR ALL OTHERS IS 5 (BEST) DOWN TO 1
- 3.) POINTS FOR DISTANCE (BY WATER)) AS BELOW:
  - 5 = 0-5 MILES
  - 4 = 6-10 MILES
  - 3 = 11-15 MILES
  - 2 = 16-25 MILES
  - 1 = OVER 25 MILES

TABLE 5

#### 4.0 CONCLUSION

Mare Island shipyard received the highest (most desirable) score of all sites evaluated. This facility offers the greatest potential to SFMNHP at the most reasonable cost. Although Mare Island is the farthest site from the Hyde Street pier, the increased distance is a small price to pay compared to the benefits of speedy, low cost startup and the compatible usage of the adjacent areas. It is difficult to imagine a better match between SFMNHP needs and facility potential anywhere else in the San Francisco Bay area.

Treasure Island, with the NPS drydock, ranked second. The low capacity of the site was offset by the low conversion costs. Treasure Island with a new, larger drydock ranked last. This site would potentially handle all of the SFMNHP vessels, but the costs would be prohibitive. Treasure Island is an attractive location which would readily draw visitors from the Hyde Street pier. However, many other parties are attempting to obtain this property, making acquisition by the NPS more time-consuming and less certain.

The Arques site and the Bethlehem site tied third. The Arques site would be attractive to visitors and ship restoration work would be welcomed by the community. However, Arques has an extremely high setup cost for a site that would not allow work on all of the SFMNHP vessels. It is possible that this site could be developed with the intent of never servicing any vessel larger than the THAYER and then contract out any work on the larger vessels. However, this would be an expensive option that would not satisfy the original objective of the SFMNHP to acquire its own ship repair facility.

Bethlehem Steel has low potential to be a suitable site for the SFMNHP. The expense to convert it would be extremely high with the potential for an increase in costs associated with the cleanup of hazardous materials. In addition, the site is in a neighborhood which is not appropriate for visitors.

## REFERENCES:

- 1) Memorandum, From: Ships Manager San Francisco Maritime NHP, To: Superintendent, concerning General management Plan, Subject: Facility Function for Ship Repair, "DRAFT", January 11, 1993
- 2) Memorandum, From: John Gallagher, Designers and Planners, Inc., To: Mike Morelli, Subject: Shipyard Surveys for Vessel Maintenance/Restoration. Initial Visit Report, March 16, 1994
- 3) Class "C" Estimating Guide, New Construction, National Park Service, January 1993
- 4) Cultural Resources Management Plan for the Fleet of Historic Ships of the Golden Gate National Recreation Area, Tri-Coastal Marine, Inc. January 18, 1988

Dredging Calculations

APPENDIX





Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

PROJECT

TITLE

JOB NUMBER

## DREDGING CALCULATIONS

\* ASSUME A REQUIRED DEPTH OF 20'

\* ASSUME ANGLE OF CHANNEL SLOPE IS 30°

DREDGING COSTS ASSOCIATED WITH SETUP OF SITE

## MARE ISLAND

THERE ARE NO SETUP COSTS ASSOCIATED  
WITH THIS SITE.

## TREASURE ISLAND

THERE IS NO DREDGING REQUIRED FOR  
PIERSIDE WORK, IT IS CURRENTLY DEEP  
ENOUGH. HOWEVER, TO OPERATE A FLOATING  
DRYDOCK WILL REQUIRE SOME DREDGING  
TO ALLOW FOR OPERATION.

\* ASSUME DRYDOCK REQUIRES A 10' BORDER

\* DEPTH OF SILT AT PIER END = 33 ft  
DEPTH AT MID PIER = 25 ft

\* NPS DRYDOCK DIMENSIONS = 369' x 84'  
HYPOTHETICAL NEW DRYDOCK = 583' x 125'

\* ASSUME DREDGE DEPTH;

MAX DRAFT OF SHIP	=	19'
BLOCK HEIGHT + 1' CLEARANCE	=	6'
DOCK PONTON DEPTH	=	15'
1' RESILT ALLOWANCE	=	1'
		<u>41'</u>

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 1 OF 3



Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

PROJECT

TITLE

JOB NUMBER

## DREDGING CALCULATIONS (CONT.)

### TREASURE ISLAND (CONT.)

DREDGING REQUIRED FOR NPS DRYDOCK

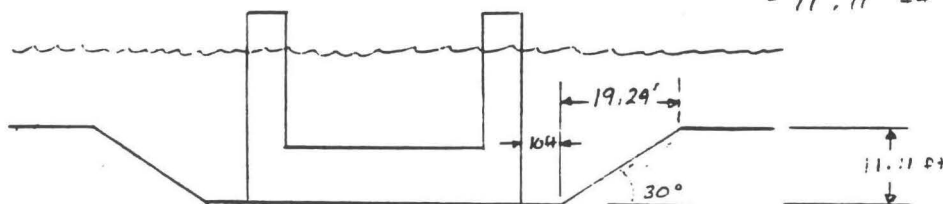
$$\text{SLOPE OF SILT} \approx \frac{33 - 25}{500} = 0.016$$

∴ AVERAGE DEPTH FOR SILT IN NPS  
DRYDOCK DREDGING

$$= 33 - \frac{1}{2}(389)(0.016)$$

$$= 29.89 \text{ ft}$$

$$\therefore \text{DEPTH TO DREDGE} = 41 - 29.89 \\ = 11.11 \text{ ft}$$



### SECTION OF DREDGE

$$\text{AREA OF DRY DOCK} = 389 \times 84 = 32676 \text{ ft}^2$$

$$\text{AREA OF DREDGE FLOOR} \\ \text{('0' BORDER)} = 409 \times 104 = 42536 \text{ ft}^2$$

$$\text{AREA OF DREDGE TOP} \\ \text{(30° SLOPE)} = (409 + 19.24 \cdot 2) \times (104 + 19.24 \cdot 2) \\ = 447.48 + 142.48 \\ = 63757 \text{ ft}^2$$

$$\text{AVERAGE AREA} = (63757 + 42536) / 2 = 53146 \text{ ft}^2$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 2 OF 8



Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

TITLE

PROJECT

JOB NUMBER

## DREDGING CALCULATIONS (CONT.)

### TREASURE ISLAND (CONT.)

$$\begin{aligned}\therefore \text{TOTAL DREDGE VOLUME FOR NPS DRYDOCK} \\ &= (53146 \text{ ft}^2)(11.11 \text{ ft}) \\ &= 590,462 \text{ ft}^3 \\ &= 21,868 \text{ yd}^3\end{aligned}$$

DREDGING REQUIRED FOR HYPOTHETICAL NEW  
DRYDOCK. ASSUME 1' GREATER DEPTH

$$\begin{aligned}\text{AVERAGE DEPTH} &= 33 - \frac{1}{2}(585)(0.016) \\ &= 28.32 \text{ ft}\end{aligned}$$

$$\begin{aligned}\text{DEPTH TO DREDGE} &= 42 - 28.32 \\ &= 13.68 \text{ ft}\end{aligned}$$

$$\begin{aligned}\text{AREA OF DRYDOCK} &= 585' \times 125' = 73125 \\ \text{AREA OF DREDGE FLOOR} &= 605' \times 145' = 87725 \\ \text{AREA OF DREDGE TOP} &= 652' \times 192' = 125,437 \\ \text{AVERAGE AREA} &= 106581\end{aligned}$$

$$\begin{aligned}\text{TOTAL DREDGE VOLUME FOR HYPOTHETICAL} \\ \text{NEW DRYDOCK} \\ &= (106,581 \text{ ft}^2)(13.68 \text{ ft}) \\ &= 1,458,032 \text{ ft}^3 \\ &= 54,000 \text{ yd}^3\end{aligned}$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 3 OF 8



Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

TITLE

PROJECT

JOB NUMBER

## DREDGING CALCULATIONS

### ARGUES SHIPYARD

NOTE ARGUES PLANS SHOW WATER DEPTH OF 10' AT END OF MARINA. HOWEVER NAVIGATION CHARTS SHOW THE DEPTH OF RICHARDSON BAY AT THIS POINT AT ABOUT 4'.

FOR THIS CALCULATION ASSUME AN AVERAGE DEPTH OF 7'.

THREE AREAS TO DREDGE

ENTRANCE CHANNEL = 500' x 100'

TURNING BASIN = 400' DIAMETER

PIER  $\frac{1}{2}$  SLIP = 360' x 60'

DEPTH TO DREDGE = 20' - 7'  
= 13'

VOLUME OF ENTRANCE CHANNEL

AREA OF CHANNEL FLOOR = 500' x 100'

AREA OF CHANNEL TOP = 500' x 145'

AVERAGE AREA = 500' x 122.5'  
= 61250 ft<sup>2</sup>

VOLUME = (61250 ft<sup>2</sup>)(13 ft)  
= 796250 ft<sup>3</sup>  
= 29491 yd<sup>3</sup>

VOLUME OF TURNING BASIN

AREA OF BASIN FLOOR =  $\pi (200')^2$   
= 125663 ft<sup>2</sup>

AREA OF BASIN TOP =  $\pi (222.5)^2$   
= 155,528 ft<sup>2</sup>

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 4 OF 8



Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

TITLE

PROJECT

JOB NUMBER

## DREDGING CALCULATIONS (CONT)

### ARGUES SHIPYARD (CONT)

AVERAGE AREA OF TURNING BASIN

$$= (155,528 \text{ ft}^2 + 125,663 \text{ ft}^2)^{1/2} \\ = 140,596 \text{ ft}^2$$

VOLUME OF BASIN

$$= (140,596 \text{ ft}^2)(13 \text{ ft}) \\ = 1,827,744 \text{ ft}^3 \\ = 67,694 \text{ yd}^3$$

VOLUME OF PIER & SLIP

AREA OF CHANNEL FLOOR =  $360' \times 60'$   
AREA OF CHANNEL TOP =  $360' \times 105'$

$$\text{AVERAGE AREA} = 360' \times 82.5 \\ = 29,700 \text{ ft}^2$$

$$\text{VOLUME} = (29,700 \text{ ft}^2)(13 \text{ ft}) \\ = 386,100 \text{ ft}^3 \\ = 14,300 \text{ yd}^3$$

TOTAL VOLUME FOR ARGUES

$$\begin{array}{r} 24,491 \text{ yd}^3 \\ 67,694 \text{ yd}^3 \\ 14,300 \text{ yd}^3 \\ \hline 106,485 \text{ yd}^3 \end{array}$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 5 OF 8





Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

PROJECT

TITLE

JOB NUMBER

## DREDGING CALCULATIONS (CONT)

### BETHLEHEM YARD

THIS REGION HAS A RELATIVELY COMPLICATED SILTING PATTERN. ALSO SOME OF THE DREDGING CALCULATED COULD BE SHARED IN COST BY SAN FRANCISCO DREDGER.

THE AREA WAS DIVIDED INTO 4 REGIONS

### APPROXIMATE DEPTH OF EACH REGION

<u>REGION</u>	<u>AVERAGE AREA</u>	<u>AREA</u>
①	9'	22,000 ft <sup>2</sup>
②	9'	15,750 ft <sup>2</sup>
③	15'	15,300 ft <sup>2</sup>
④	1'	5,400 ft <sup>2</sup>

### VOLUME OF REGION ①

$$\text{DEPTH} = 4'$$

$$\text{DEPTH TO DREDGE} = 20' - 4' = 16'$$

$$\text{VOLUME} = (22,000 \text{ ft}^2 \times 16') = 352,000 \text{ ft}^3 \\ = 13,037 \text{ yd}^3$$

$$\text{SLOPING SIDES} = 370 \text{ ft LONG}$$

$$\text{AREA} = \frac{1}{2} (16 \text{ ft} \times 16 \text{ ft} + 4 \times 30 \text{ ft}) = 221,750 \text{ ft}^2 \\ = 82,030 \text{ ft}^2 \\ = 3,038 \text{ yd}^3$$

$$\text{TOTAL VOLUME} = 16075 \text{ yd}^3$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 6 OF 8



Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

PROJECT

TITLE

JOB NUMBER

## DREDGING CALCULATIONS (CONT.)

### BETHLEHEM YARD (CONT.)

#### VOLUME OF REGION ②

$$\text{DEPTH} = 9'$$

$$\text{DEPTH TO DREDGE} = 20 - 9' = 11'$$

$$\begin{aligned}\text{VOLUME} &= (15,750)(11) = 173,250 \text{ ft}^3 \\ &= 6,417 \text{ yd}^3\end{aligned}$$

$$\text{SLOPING SIDE} = 140 \text{ ft LONG}$$

$$\begin{aligned}\text{AREA} &= \frac{1}{2}(11 \text{ ft})(11 \text{ ft} / \tan 30^\circ) \\ &= 104.7 \text{ ft}^2\end{aligned}$$

$$\begin{aligned}\text{VOLUME} &= (140)(104.7) \\ &= 14,670 \text{ ft}^3 \\ &= 543.3 \text{ yd}^3\end{aligned}$$

$$\begin{aligned}\text{TOTAL VOLUME} &= 6,417 + 543.3 \\ &= 6,960.0 \text{ yd}^3\end{aligned}$$

#### VOLUME OF REGION ③

$$\text{DEPTH} = 15'$$

$$\text{DEPTH TO DREDGE} = 20 - 15' = 5'$$

$$\begin{aligned}\text{VOLUME} &= (15,300)(5) = 76,500 \text{ ft}^3 \\ &= 2,833 \text{ yd}^3\end{aligned}$$

$$\text{SLOPING SIDE} = 90 \text{ ft LONG}$$

$$\text{AREA} = \frac{1}{2}(5)(5 / \sin 30^\circ) = 25 \text{ ft}^2$$

$$\begin{aligned}\text{VOLUME} &= (90)(25) \\ &= 2,250 \text{ ft}^3 \\ &= 83 \text{ yd}^3\end{aligned}$$

$$\begin{aligned}\text{TOTAL VOLUME} &= 2,833 + 83 \\ &= 2,916 \text{ yd}^3\end{aligned}$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 7 OF 8





Member of the BMT  
Group of Companies

# DESIGNERS & PLANNERS, INC.

TITLE

PROJECT

JOB NUMBER

## DREDGING CALCULATIONS (CONT.)

### BETHLEHEM YARD (CONT.)

#### VOLUME OF REGION ④

ASSUME A SLOPING REGION FROM OF  
DEPTH AT THE SLIP TO 20' AT THE BOTTOM

AVERAGE DEPTH OF SILT = 1'  
DREDGE DEPTH IS 19'

VOLUME OF WEDGE IS

$$\begin{aligned} V &= \frac{1}{2} (90' \times 19') \cdot (60') \\ &= 51,300 \text{ ft}^3 \\ &= 1900 \text{ yd}^3 \end{aligned}$$

ADD SLOPING SIDES

$$\begin{aligned} \text{WIDTH AT MAXIMUM} &= 19' / \tan 30^\circ \\ &= 32.9 \end{aligned}$$

$$\begin{aligned} V &= \frac{1}{2} (19') (32.9') (90') \\ &= 28,129 \text{ ft}^3 \\ &= 1041.9 \text{ yd}^3 \end{aligned}$$

$$\text{TOTAL VOLUME} = 2942 \text{ yd}^3$$

TOTAL VOLUME FOR BETHLEHEM YARD

$$\begin{aligned} &= 16075 + 6460 + 2916 + 2942 \\ &= 28893 \text{ yd}^3 \end{aligned}$$

PREPARED BY

DATE

CHECKED BY

DATE

SHEET 8 OF 8

U.S. 70 5007447302 11.0.2



J. Porter Shaw Library  
S.F. Maritime NHP